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A CHAPTER ON RAILWAY ECONOMY.

BY WM. S. HUNTINGTON.

[Written for the AMERICAN RAILROAD JOURNAL.]

THERE is little risk in saying that there is nothing in this world less understood than the true inwardness of economy. It is not economy to save a dollar when it costs $1.50 to accomplish this saving, and yet this is the method that is practiced to a great extent by individuals and corporations. To a certain degree a little false economy is admissable, but this applies to individuals who undertake to do business with limited means and with a hope to make things more substantial and safe in the near future. It is vastly different with a corporation that has unlimited means and uses inferior material because it can be bought for a merely nominal sum as a matter of economy. Too much economy has been the death of more people than were destroyed in Buddensiek's buildings, and some of our American railways have been great sufferers by it.

Some years ago it was considered economy to use steel rails in place of iron and that was true. For a time we had good, honest steel rails and they were durable and safe, and notwithstanding their excessive cost, it was considered economy to use them. But after a time the ingenious rail-maker discovered a way to work in slag and cinders and make a steel rail much cheaper than a good iron rail could be made for. The rail-makers could hardly be blamed for this, inasmuch as railway officials refused to pay a good price for a good article, but gave contracts to the lowest bidder regardless of quality. Not long ago a gentleman was negotiating for a position as superintendent of a rail-mill, when he was questioned very closely as to the amount of slag he could work into a steel rail. The desire to manufacture shoddy railway material did not originate with the manufacturers. The railway officials, by their refusal to pay fair prices for honest, good material, have forced manufacturers to make use of all the tricks known to the trade and to invent new ones, and this has been practiced to such an extent that the steel rails now coming into general use are far inferior to third-class iron rails.

Steel rails are put forth in all the railway advertisements as an element of safety, and people embark on a steel-rail track with a feeling of security; whereas if they knew they were riding on an iron-rail track, they would feel decidedly uneasy and unsafe. The truth is, broken rails are becoming more frequent, while we should reasonably expect that accidents from broken rails would diminish as steel rails are put in use. A poor steel rail is not as good as any kind of an iron rail, and the economy that supplies them is very thin. It is rather expensive to provide good, honest rails, but it does not cost nearly as much to lay a track with good rails as it does to fish a train out of a ditch every few days.

And aside from rails, there are other fixtures and appliances that are of very inferior quality purchased under the same false economy that inspired the purchase of shoddy rails. I have examined piles of broken rails, links, pins, wheels and axles and have never been able to discover a fracture in good, honest material. It is true that defects will escape the watchfulness of the most vigilant inspectors, but the failures of good, honest appliances are rare. I have seen piles of new links and pins that were made on contract at ruinous prices for good material. I have taken links and pins out of these piles, and with a single stroke aross an anvil broken them like a piece of cast iron. The business of the manufacturer was to deliver them and get his pay for them, and the quality corresponded with the price.

Some railway officials plead poverty as an excuse for providing cheap material. This reminds me of what Horace Greely said in a speech at an agricultural fair. He said that a wealthy farmer could afford to do some very slovenly farming, but a poor man could not. The idea was that the wealthy man would not suffer by his indiscretion, whereas a poor man would get poorer by reason of his slack attention to business and slip-shod way of doing it. When we find a successful business man we naturally think that he gets the best the market affords. Why do not corporations do the same and get the best? The motto should be with every railway official, "Get the best."

There is no place where folly is more exempified than in the purchase of railway supplies. Too much legislation is not good, but we, the people of the United States, wish to have it enacted that no railway or other corporation shall build or operate any road unless constructed with good, honest material. The worst economy in this world is buying poor railway material, and the most successful roads are those that have always been thorough in their equipment and repairs.

There is nothing that will put a railway into the hands of a receiver sooner than a thorough practice of the kind of economy under consideration. Look into a keg of spikes, bought at less than bottom prices, and you will see many of them without heads and more without points; many of them burned in two, and but very few in a keg will stand driving, and if they do the heads soon break off and they become worse than useless. Splice-bars and bolts of inferior quality are purchased at low rates, while cheap and dirty lubricants cause hot boxes, cutting of expensive bearings and trouble generally; cheap wheels, cheap axles, cheap running-gear and brakes, cheap fuel, cheap bridges, cheap ties and drainage, cheap pegs and switch-fixtures, cheap and overworked enployés and operatives and cheap everything, all of which have, combined, produced nearly all the seri-

ous railway accidents on record. "Failure of track and equipment" is the verdict in a large share of the accidents that are recorded, and it is safe to say that 90 per cent. of all railway accidents are the result of too much so-called economy.

Not long since the writer was in coversation with a railway official and the former mentioned the fact that some roads which he named rarely met with an accident, while others were always in trouble. "Yes," said he, "the roads you mention are abundantly able to use first-class material and keep everything in first-class condition which prevent accidents." Now the fact in the matter is that the roads named as free from accidents were as poor in their early days as any roads in the country, but the managers thereof made it a rule to get the best, and preferred to pay liberally for safety appliances rather than drain their treasury on damage accounts. It is not the amount of traffic that fills the till so much as the amount saved by preventing accidents.

Any one who will take the pains to look into the financial condition of American railways and get a correct history of their management, will not fail to notice that those that are the most popular and pocket the largest percentage of earnings, are those that have been kept in the best possible condition for safe traffic regardless of expense. He will also notice that the roads that furnish shoddy material and are impoverished by the disasters resulting therefrom, have a weakness for costly private palace-cars for the officials, and thus with railways as with individuals, poverty and style go hand in hand. It is time a reform was inaugurated in this matter and some *genuine economy* practiced. We have had too much false economy and want a change.

THE QUESTION OF SPEED.

BY LAWRENCE T. GOFF.

[Written for the AMERICAN RAILROAD JOURNAL.]

THE conditions upon which depends the attainment of high velocities on our railways, are numerous and varied. Much, it is true, remains to be done in the improved construction of locomotives especially adapted for high speed, and the question broached by a recent contributor to the JOURNAL relative to the re-introduction of inside-connected locomotives is one that may be profitably entered into and discussed; but the uninitiated are greatly mistaken if they imagine that with the solution of the question of the proper construction of engine the problem of high speed has been solved. There yet remain the equally important questions as to conditions of track, gradients, the population of the territory crossed, the amount of travel over the line, the frequency of stoppages, and a number of less important but equally relevant matters, without the due consideration of which high speed as a constant every day factor in railway management becomes impossible.

Given an engine capable of pulling an ordinary train of passenger-cars at a uniform rate of sixty miles an hour, and it is evident that the other conditions will render such a speed impossible save for short distances where the obstacles in the way of reaching the maximum speed are not present; but such sections of track are rare, and it is a safe estimate upon a reduction of twenty-five per cent. from this maximum. In a similar ratio it is also safe to assume that under ordinary conditions of travel the steady average of speed attainable by any train is twenty-five per cent. less than the actual capacity of the engine under conditions that could be deemed perfect. Probably in actual practice a still greater reduction is experienced.

Thus we see that the question of motive power is but one of a number of questions entering into the attainment of high speed, and it is not only the locomotive-builder who has to solve the problem, but the chiefs of every department of railway construction and management.

Smoothness of track and absence of grades are matters for the track-constructors to consider, and in thinly-settled districts the conditions of permanent way are of the highest importance to the attainment of high speed for long distances. Possibly it is common for track-constructors to lay their rails with the greatest care in the streets and roads of towns and villages; but while not arguing against this scrupulousness in regard to the thoroughness of work at populous points of a road, it is evident that so far as the mere question of speed is concerned it is of less importance that the track should be smooth and free from grades in towns and cities than in the outlying districts; for trains are compelled to move with comparative slowness through thickly-settled points. No matter how perfect the conditions for reaching high speed may be, there will always be a loss encountered in traversing cities, unless the railway should pass through tunnels and cuttings, or over bridges, thus avoiding the crossing of streets and roads on a level, which avoidance is not universally the case.

The amount of travel over the ordinary double-track road has also an important bearing upon the attainable speed. A heavy freight business will undoubtedly tend to lower the average speed, as it is impossible to keep the track sufficiently clear to permit of a certainty in reaching the maximum speed as a daily average. It is true that this one objection—freight traffic—has in many cases been entirely obviated by building separate tracks for freight-trains, but is evident that a road must be in pretty successful operation before it can undertake such an extensive increase of road facility.

The question of frequency of stoppages is another highly important and at the same time, delicate question. Where competing roads are endeavoring to obtain the bulk of patronage in towns along their lines, the sin of omision in regard to train accommodation is visited with swift retribution. The worthy inhabitants are quick to feel slighted if train after train passes through their town without stopping, and if another road is more generous in its accommodation it will be likely to obtain the greater, and in fact, almost the entire local patronage. To some extent this difficulty has been overcome by the introduction of the common-sense "flagging" system, by which trains are stopped at certain points only in case there are passengers to take up or deposit; and doubtless the flagging system conld be employed to a greater extent than at present with beneficial results; but at best an average time allowance must be made for signal stops, and the rate of speed lessened thereby. While express-trains, running between two important centers, and having few, if any, intermediary stops, are not directly affected by this

question, they are indirectly, for if the local traffic is great and the train accommodation ample, there are always unforseen delays occurring which must be discounted and an allowance made for their occurrence. With local trains, a very high rate of speed will never be possible, relatively speaking, for the stoppages will of necessity be numerous, and even if to obtain a greater speed more trains are run alternating in their stops at local points, while a little time may be gained, the increase of travel will increase the allowance made for unforseen detentions, and if connections with boats or other roads are to be made at these local points the allowance must be generous.

Despite all these drawbacks we are making wonderful progress in the matter of railway speed, and to-day run the fastest trains in the world. The old hallucination that England beats us in the speed of our passenger-trains is fast disappearing, and our people are beginning to realize that in this regard America is at the front. The above questions are meeting with constant study, and capable management has reduced the speed question to an exact science. Of course the limit of speed has not yet been reached, and I doubt the soundness of George Stephenson's opinion that railway trains could never much exceed a speed of sixty miles an hour; but of late the principal increase has resulted from a study of the small obstacles—the saving of a few minutes here and there, a saving small in each individual case but aggregating in a great time economy; and the increase of the capacities of passenger-train locomotives will undoubtedly continue even after systematic management has accomplished the utmost economy of time in the study of the smaller details. We have only to wait and we may yet travel at the rate of one hundred miles per hour.

In the meantime it is hardly necessary to state that one of the greatest questions if not the greatest, entering into the question of speed, is the discipline and system of a road. Without a perfect system and a rigid discipline high speed would be impossible even were every other condition perfect; and certainly in this respect our leading lines are deserving of the highest praise; for every day sees a greater attention paid to those details of travel which have greater bearing than the average traveller would think, not only upon the speed of trains, but upon the comfort, safety and reliability of railway travel.

AN INSTRUCTIVE EPISODE IN BRIDGE-BUILDING.

BY THOMAS M. GRIFFITH, M. E.

[Written for the AMERICAN RAILROAD JOURNAL.]

ANY notice of bridges for teams and pedestrians, might be deemed out of place in a journal devoted to the interests of railways and such matters as at first sight seem to be directly related to them. But as a river is fed by tributaries, and they again by smaller streams, so the great volume of the business of a great railway line, must come to it through humble but many sources. Therefore common roads are a necessity of their existence, and as these common roads must in most cases cross more or less gulches, ravines, and streams, bridges are a necessity to them, and of course to the railways. In many cases it is so much to the interest of a railway located in a valley traversed by a river, to draw business to its line from the opposite side, that it has been their policy to encourage, so far as possible, the construction of such bridges. Of course it is needless to say that the adjacent county has in such cases derived a benefit quite commensurate with any advantages which the railways may have acquired in thus endeavoring to swell the amount of its freight.

Of course it is impossible for railway companies to undertake the construction of many such bridges. The most that can be expected of them, is that they may give aid and comfort to the enterprises by indirect means which may not seriously interfere with their more important functions. As the great through lines of railways now carry almost all passengers and freight, there no longer exists the necessity for long and direct common roads with their coaches and freight-wagons; consequently there are comparatively few long, or large road-bridges required for them, and the railways are developing the necessity for short roads which for the most part need to cross only the smaller streams.

Up to some twenty or thirty years ago almost all bridges which were not built of stone were built of wood, both for common roads and railways; but the growing scarcity of timber and its increasing price have wrought a great change in bridge construction until now they are almost universally built of iron and steel. Formerly it was the province of the railway engineer to design the bridge structures of his road; now his duties are mainly those of location, and advisory in purchasing material.

As a rule a railway company may supply its line with first-class iron or steel bridges with little trouble from the fact that they usually know through the advice of employed experts, what they want, and there are highly reputable, and responsible firms, upon whose material and work they can depend; but unfortunately this happy condition of affairs does not seem to exist to a large extent when the means by which the smaller common road bridges are promoted are brought into play. Here there appears to be a sort of happy-go-lucky, hit-or-miss system, or no system at all, which might, were it not that its results quite often are serious, be regarded as comical. We will suppose a case where the proposed bridge is not to be a toll-bridge built by a joint stock company composed of citizens who have investigated, as far as lay in their power, the possibility of the scheme and its probable cost, but one which is to be built by a county, through its supervisors, none of whom have any particular interest in the affair, and perhaps none of whom would be capable of giving much time or attention to it.

This suppositive case occurred in the county of Hard-scrabble, the citizens of which had elected their board of supervisors with the understanding that a bridge must be built over Coon Creek in order to shorten the distance between a distant part of the county, and the Cross-Tie Railroad station. The election had been a closely contested one as various interests were to suffer by the improvement. Several saloons would without doubt lose a considerable part of the lucrative business they had so long enjoyed, and some of them saw ruin staring them in the face. This fact had for a series of years kept the enterprise back, but now there was a hope that it could be pushed forward. "Pursuant to a code" the new board of supervisors met, and after a few preliminaries the

bridge question came up, was discussed at some length, and then the meeting adjourned. At each subsequent meeting this all-important question was the chief order of business, and at one of these meetings it was decided that the bridge should be let by contract to the lowest bidder. Of course no survey or plans had been made, and in fact, owing to local jealousies, the exact location for the structure, whatever it was to be, had not been decided upon. An advertisement soon brought a swarm of seekers after contracts whose method were not formulated by ethics or mathematics, but which assumed many various forms. Some hoped to obtain the coveted prize by appealing to the supposed cupidity of the supervisors and outside men of influence, and their lumber yards, stone quarries, etc., were looked at with a promising eye, as places which might be worked in the interest of the proposed improvement. Others were more direct, thus emulating the short route from point to point which the public work was to effect, and yet another appealed to the taste for drink which the rubicund probosces of some of the moulders of public sentiment in Hardscrabble county indicated as the proper weapon with which to batter down the wall of their citadel.

Occasionally ten or more of these contract-seekers would come in conflict, and at such times the effort to outdo each other by a display of scientific skill and stories of long experience and practice in their art, would lead the uninformed listener to infer that this small improvement in an interior town and over a small creek had attracted the attention of the greatest constructive minds of the age. Their theories were as wonderfully varied as their experiences had been, and the awed supervisors and the leading men were confused with their own weakness and ignorance of what to do. Leading questions were propounded by them, generally to be met by unsatisfactory answers, and more especially as to the best site for the bridge; and the interest of the land-owner who was or was not to be benefitted by it formed a most alarming fact in their decisions, each being anxious to follow the wise advice of Roderigo to Dago: "Put money in thy purse."

The hotels and saloons were prosperous. Almost every train which arrived brought guests to them, who must spend a few dollars with them, and the arrearages of Boniface with his butcher, baker and grocer were made up, and business was looking brisk in Hardscrabble county. It became a question would it not be well to advertise further and wider, and defer the letting indefinitely in order to continue this influx of travel and money to the county of Hardscrabble, but after a time those persons who did not perceive that they were directly benefited by it, and were moreover jealous of the supposed great accumulation of wealth by those who were the first to receive benefit and supposed to be the only ones who were to derive any of the advantage of this golden tide, began to exhibit a nervous discontent, and, arraying themselves in an opposition party, denounced the whole scheme as a useless expenditure of public money, and a fraud upon the taxpayer. The improvement party then felt the necessity of urging heroic measures and the outside pressure became so powerful that the day for opening bids was set and the award was let to the lowest bidder.

Now it so happened that the span of the bridge had been determined upon, but there was no plan or map to show that the stream made a sudden turn at the foot of the street where Slim Jones, who owned the adjacent property, had succeeded by some method never fully explained, in persuading the supervisors to locate the bridge; and this fact had not been discovered until the contract between the successful adventurer and the county of Hardscrabble had been sealed, signed and delivered, and then it was pointed out by a stranger who happened by a mere accident to come to town.

Great was the consternation at the announcement of this long-existing but recently discovered fact, and greater still the unanimity of judgment on all sides that if a bridge of that given span were set on the line of the street, the first flood would be disastrous of consequences to the bridge as well as private property. The people of Hardscrabble therefore remonstrated against an absurdity which had now become so apparent to all. Another fact developed itself soon to the citizens of Hardscrabble county and its supervisors, and that was that in order to obtain any modification of the contract between the county and the bridge-man, great concessions would have to be made by the county, that is to say, the bridge man had a good hold on the county. In other words he had a good hold of the handle-end of the whip while the county did not even have any hold of the little, or lash end of the instrument of torture. Soon after this the stranger who had appeared in town after the excavation for the abutments had been made and the foundation had been started, and who had so disinterestedly given it as his opinion that the abutment of the bridge was a bad one, made his appearance again, and this time he seemed to fraternize with Slim Jones, who owned the adjacent property, and with the bridge man, who also came at the request of the supervisors who were anxious to know how they could best and easiest extricate themselves from a blunder by modifying the terms of the contract, as these three persons were seen together in a most agreeable state of mind and apparently in full accord with each other.

The bridge man upon being interviewed, issued his ultimatum which was that he would permit of no change in his contract, which he was ready to fulfill, without full damages for the amount of work that had already progressed, and a large extra for any change or addition, as he was ready to put the bridge upon the wall erected to receive it.

The writer has forgotton the exact price claimed, but the cost to the county of Hardscrabble, was some three times what the improvement should have cost. This was not the worst of it, for the almost unanimous verdict of the persons who had sought super-structure contracts was that the building of piers and abutments was a very simple and easy matter. The supervisors had been lulled into a sense of ease and security as to that part of the work as one about which they need give themselves little trouble, and as the super-structure contract had cost them a larger proportion of the sum of money which had been appropriated than they had expected it would, they all saw the necessity of reducing the cost of the masonry to a minimum. Therefore this part of the work was let to a local mason whose business had previously been confined to the building of stone walls in the village and in the surrounding country. Now unfortunately for the county and this stone mason, who was really more anxious to do a good job than his experience justified himself or any one else

in hoping that he could do for the price at which he had agreed to do it, there occurred a freshet of unprecedented dimensions soon after his work was up and the bridge man had rested his frail super-structure upon it, and the stream having been narrowed very much by the pier and abutments, which, notwithstanding the improved direction which had been given to them after the advice of the disinterested stranger, were insufficient for the easy passage of the water, and a large part of it found a convenient channel over the road approaches to the bridge, and through gardens and back-door yards, tearing out the crops, and disturbing setting hens and in several instances floating away with their privacies, and before the rush of water was through with, one of the abutments toppled over and the new iron bridge fell with a crash, and was a mass of bent iron beams, and rods, which appealed to the sympathy of the junk-dealer. And now the county was minus a bridge even at its great cost, and had an awkward obstruction to remove, besides several ugly claims for damages to private property, the largest of which came from Slim Jones, the most active person in promoting the scheme, and locating the work.

This catastrophe fell like a thunder-clap upon the poor county of Hardscrabble, and it was several years before it could recover from the shock. But the people of the county during that dark period gathered themselves together, especially during the long winter evenings, in the stores and bar-rooms, and discussed the catastrophe and the various mishaps, errors and steps which had led to it. They canvassed the capacity, and the character of the supervisors, and of the moving spirits which had influenced their action, and more especially that of Slim Jones, who began to be looked upon by all with suspicion and distrust, and by the most outspoken, was boldly denounced as a fraud, a cheat and a rascal.

It was also ascertained that the bridge man was a shrewd teamster, who had been employed by one of the contractors who had graded a section of the Cross-Tie Railroad, and who had been attracted thither by the advertisement and the hope of a better position in life, and that after obtaining the award, had purchased a bridge of the Jack-of-Clubs Iron Bridge Company, which has the worst reputation of any pot-metal concern in the country; and that the disinterested stranger, was, to use a term much used in Hardscrabble county, "in cahoots with him," and also with Mr. Slim Jones. The latter person it was suspected had furnished most if not all of the money with which to set the bridge man upon his legs.

The most enlightened among the inhabitants of the county finally assembled together to discuss the direct and indirect losses to the county in money and business. The simple methods of arithmetic were quite adequate for the first, but for the last the skill of a political economist was required. The chief products of Hardscrabble county were flag stones, hoop-poles and tan-bark, and without the bridge it was impossible to reach the most available station of the Cross-Tie Railroad with these heavy products except at the lowest stages of water, when Coon Creek could be forded; and consequently large piles of these commodities had accumulated on the bank of the stream awaiting favorable times for re-loading and crossing the ford with them to reach the station; and sometimes the commodities were delivered at the station at a time when there was a rush of other business so that they could not be shipped at the most advantageous rates. This brought the inhabitants of Hardscrabble county generally into bitter hostility with the Cross-Tie Railroad Company, but in the end it had the effect of directing the attention of the officers of the road to the trouble, with a view of assisting the county of Hardscrabble, and making itself sustaining and less dependent upon the heavy assessment placed upon it for the poor privilege of crossing it and reaching the more productive regions beyond. They therefore instructed one of its most prudent engineers to domicile himself at the leading hotel in the village and educate the most intelligent and influential of its residents when opportunity occurred as to the proper thing to be done. In due course of time an arrangement was made between the county of Hardscrabble, and the Cross-Tie Railroad Company, by which a part of the taxes of the latter were to be remitted for a period of years, in consideration of the construction and maintenance of the bridge by the county, the Cross-Tie Railroad Company to furnish free transportation for all of the material required in its construction, and to contribute one-third of the amount the bridge would cost, and by this time the greater enlightenment of the supervisors had suggested that a competent engineer should be employed to make a thorough survey of Coon Creek and furnish plans for a bridge.

Mr. Tripod Boots was duly elected by the supervisors, by the advice of the president of the Cross-Tie Railroad Company, and his appearance in town created quite a sensation. His first business was to inquire of the oldest settlers in regard to the highest water which they had seen, and to seek for water-marks by which to coroborate their statements. Then there were a few days spent in surveying and mapping Coon Creek for some distance above and below the bridge site. Some days after this he exhibited a plan for construction and location of the piers and abutments which were set so far apart as to admit the largest volumes of water which were ever likely to occur to pass freely between them.

In due time a good and substantial bridge was erected upon this masonry by the Tubal Cain Iron and Steel Bridge Company, and the county of Hardscrabble is now and has been for some years deserving of a better name than it has enjoyed. Other industries have developed, everybody has something to do, taxes are lighter and those of the Cross-Tie Railroad are less than half of what they were when the road was first opened and when it was the least able to pay them.

The county supervisors were so well pleased with the bridge and themselves that upon its completion they voted a considerable sum out of the treasury to have a cast-iron tablet made, including all of their own names in full, and that of the engineer, Mr. Tripod Boots, upon it in bas-relief letters, and they had it rivited fast to the iron frame of the bridge.

This suppositive case is not so very suppositive as the reader might suppose; but is a tolerably fair sample of what has been and is now being the parallel and hard experience of many a much-needed public utility in some of the highways and by-ways—even in regions not very remote from the supposed centres of civilization—and in the hope of shedding a little light on the methods now in vogue of constructing public improvements, I have given it without comment to the readers of the JOURNAL.

THE PRODUCTION AND CONSUMPTION OF RAILS.

THE iron trade is aptly termed the barometer of the general prosperity of the country, and during the past year business men of all classes have been eager for any news pointing to a revival of this important industry. It may be stated with as much show of justice that one of the best indicators of the condition of the iron trade itself is the status of the steel-rail industry. Such a statement may be justified by pointing out that the railroads, the best customers of the iron and steel-mills, are forced before anything else to anticipate their requirements of rails, which cannot be classed as a staple article, and must, therefore, be ordered months in advance. It is undoubtedly true, on the other hand, that our Bessemer steel industry is suffering from evils which do not to that extent affect other branches of the iron trade. The latter are not so abjectly dependent upon the railroads. They have many other consumers to fall back upon, some of whom may and do flourish at times when existing railroads are poor and new enterprises are not thought of. Still the fact remains that every single department of iron-making keenly feels the want of orders from that quarter, the influence of the fluctuations of which may, however, be best traced in dealing with rails.

The demand for rails comes from two sources—for new construction and for renewals. A very fair approximation to the former may be estimated from the careful compilations of new mileage added annually to the network of railoads in the country. There are, however, some difficulties to contend with which render accurate statements of consumption for this purpose impossible. The quantity of rails required per mile of track varies within very wide limits. It is only 61.5 short tons for narrow gage and as high as 99 tons for standard roads. Besides this, the weight of the rails used is much greater to-day than it was ten years ago. It may be assumed that in 1867 the average was 90 tons per mile, gradually increasing until it is now 95 tons per mile. Another point to be considered is the mileage of the second track, sidings, etc. It, too, has steadily increased. From present statistics it would appear that the accessory tracks add as much as 23 per cent. to the length of the road in the United States, and therefore at least 20 per cent. may be added to the number of miles of new road built every year to get at the actual mileage of track laid. Thus a series of figures are obtained on the basis of the number of miles of railroad constructed annually, from which a fair estimate of the quantity of rails used for this purpose may be deduced. On the other hand, we know from the statistics of production of iron and steel rails, carefully collected annually by the Iron and Steel Association, and from the imports of rails, how large the apparent consumption was every year. This, of course, neglects the stocks in makers', consumers' and importers' hands, which, however, in the case of rails are a less important matter than in the majority of other commodities. The difference between this apparent total consumption and the quantities used for new mileage would fairly represent the consumption for renewals. The following table has been computed in the manner indicated:

	Increase of Mileage.	Total Consumption.	New Roads.	Renewals.
1867	2,449	627,157	279,200	347,957
1868	2,979	756,795	339,600	417,195
1869	4,615	906,749	504,000	402,749
1870	6,070	1,019,153	663,000	356,153
1871	7,379	1,341,434	814,800	526,634
1872	5,878	1,530,850	648,900	881,950
1873	4,107	1,148,849	453,400	695,449
1874	2,105	837,724	234,900	602,824
1875	1,712	810,770	191,000	619,770
1876	2,712	879,916	302,600	577,316
1877	2,281	764,744	257,300	507,444
1878	3,687	882,695	303,000	579,695
1879	4,721	1,157,420	532,500	624,920
1880	7,174	1,752,526	817,800	934,726
1881	9,789	2,230,421	1,116,000	1,114,421
1882	11,591	1,912,921	1,321,000	591,921
1883	6,755	1,399,671	770,100	629,571
1884	3,800	1,120,000	434,200	685,800

It will be noted that in a general way the quantities for renewals fluctuate far less violently than do the amounts used for the construction of new roads. The figures for the latter lap over, of course, from year to year—that is to say, a considerable proportion of the rails produced in one year are in reality for consumption in the next, and the variations from year to year, therefore, appear more violent than they probably are. This partly explains such apparent anomalies as are exhibited by the fact that, although the mileage of new roads built in 1882 was much larger than it was in 1881, the consumption of rails shows a heavy decline. Of course, being deducted from the tonnage for new road-bed, the requirements for renewals are in a similar manner less subject to sudden variations than indicated in the table. With such variations growing out of the necessary intervals of time between the manufacture and the laying down in the tracks, the table given illustrates some important general truths. It shows that our rail-mills can depend upon a certain quantity of work annually, say, at least, 600,000 tons for renewals. It is well known, and this fact is brought out clearly in our estimates, that the requirements for this purpose may be withheld for years, and then may come with a rush which stimulates booms. This accumulated demand, it may be noted, is the first to make its appearance. This is only natural. One or two years of prosperity to the railroads induces its officers to make repairs long deferred; then, flush times continuing, comes the craze for feeders and branch lines, followed by the wild scramble into new enterprises by the general public. The period of 1880 to 1882 witnessed a movement of this kind, which was probably exaggerated by quite a widespread replacement of old, worn-out iron track by steel. The drop in the quantity to the normal needs, or probably less than normal needs, in 1882, shows how that movement had spent its force while the other was still working toward its climax.

It would be idle to deny that the wants of the railroads for the replacement of worn-out rails are likely to fall off rather than increase, in spite of the greater mileage in use. All our roads of any importance are now equipped with steel rails, which, even under a heavier traffic, heavier cars and heavier engines, are likely to last longer than the old iron rail under a lighter duty. Unfortunately, we do not possess any very reliable statistics concerning the percentage of track still laid with iron, and even if we did, the bare figures would not permit of any valuable deductions without data to judge of the traffic which roads so equipped are called upon to bear.

Taking everything into consideration, it may be asserted, on the basis of the estimates submitted, that between 600,000 and 700,000 tons of rails will be called for annually for renewals, while the amounts wanted for new roads will vary in direct proportion to the mileage under construction. If we continue to build at the rate of 4,000 miles per annum, which is not probable under existing circumstances, the orders from this source will be less important than those for the purpose already referred to. This means a prevalence of inquiries for small lots of rails, which have been, and promise to remain, a leading feature of the markets. The outlook, statistically, is certainly not one of great encouragement to our rail-mills. With full possession of the field, unhampered by foreign rivals, their capacity is in excess of any early prospective demand, and, other things being equal, works of smaller capacity, which can be kept running regularly, appear to have the advantage over their larger competitors.—*Iron Age.*

THE ENGAGEMENT AND MANAGEMENT OF RAILWAY EMPLOYES.

GOOD men, who have become acquainted with their duties and who perform them with faithfulness, are the most important of all the appointments of a railroad. It is a long process to educate a fresh man to a new place or to a new business; all the experience which the old hand has acquired is of value to his employer so long as he continues to do well or to intend to do well, although too long continuance in one round of duties is apt to make a good man dull, and it is therefore advisable to make some change occasionally for all employés, promoting them if an opportunity presents, which will encourage not only them, but their associates, who then see that patient merit attains reward, even though slowly. Frequently, with a little trouble, a vacancy may be availed of to move several persons up one round of the ladder each, and conscientious managers find much pleasure in the larger number who can thus be made happy, at the same time that the service is benefited and strengthened. It is easier for indifferent managers to fill a place with the fewest number of changes.

The great advantage to the company of experienced men makes it a difficult matter, sometimes, to decide upon the most judicious course when a disaster caused by the neglect or oversight of an employé calls for a judgment upon him. The *disciplinarian* would dismiss him from principle, believing that he had thereby taught a lesson to the remainder of the force; but it is doubtful whether the fear of dismissal has any effect upon the larger number of employés. Let the manager consider how it is with himself or with the other officers of the road; do they perform their duties because of fear, or because they have undertaken them and feel a manly pride in seeing them well done? There are sneaks, of course, among railroad employés as among officers, yet they are rare; the great majority are meaning to do their duty as they understand it.

The case of an erring employé should be tried upon its merits, with regard to the previous record of the employé, considered with reference to the interests of the company, and generally without regard to the other employés. Has this always been a careful, dutiful man? Did his fault arise from ignorance, forgetfuluess, indifference or laziness? If from ignorance or misjudgment, did he use the best wits he had and do as well as he knew how? If so, he does not deserve great condemnation, even though he may have caused great damage. If from forgetfulness, not habitual, but instantaneous, as has often happened to switchmen and conductors, dismissal is no remedy; the remedy has been applied by the accident; he will be a safer man ever after. If the fault was from indifference or laziness, it is sure proof of a worthless character—that is, worthless for railroad purposes. Good conductors and excellent enginemen have forgotten for a dangerous interval their telegraph orders, and caused disasters; when pardoned because of their long and perfect records, they proved safe men and the most devoted servants of the company for years after. It was not found that this leniency had a bad effect upon discipline as related to the other employés; on the contrary, these perceived the value which a good record might have for a man who fell into trouble.

All men must have some education in railway operations before they will become experts, and in requiring this they will make some mistakes likely to cause accidents and trouble; it would be a grave error on the part of the manager to discharge men who have had this education at his expense, to take on fresh men to be educated in the same way. We can imagine something of the state of a road upon which all the men should be new to railway business, or, even if experienced men, new to the road. By the frequent discharge of employés, for trivial mistakes, some roads maintain a permanent approximation to this condition: their accidents are not thereby diminished in number.

The standard of character among employés may always be raised by slow degrees, but surely, if proper care is exercised in the hiring of new men. Generally something can be learned about the character of every applicant; a wandering man without a certificate from his last place is not a desirable acquisition, and even a certificate requires to be scanned closely. If a man is employed upon a certificate from another road it is a safe precaution to write to the officers of that road for private assurances; for, in the first place, many officers give unwarranted certificates, which they will not support in private correspondence; in the second place, there are men who make a business of furnishing certificates of character and recommendations for passes to any one who will pay for them, frequently stealing the genuine letter-heads and forging the office dating-stamp. The sons of industrious farmers in the vicinity of the road are usually glad to get employment, and are a healthy stock to recruit from, if judiciously selected.

Brakemen and firemen are two classes of men who require to be chosen with peculiar care, as it is from them that the conductors and enginemen are to be developed; and since they are really apprentices, with the largest pay that any apprentices receive in any trade, it is not worth while to throw away the valuable instruction they are to receive upon inferior characters. Upon brakemen a great responsibility is necessarily placed from the first. A reliance upon them for faithful performance of their duties without good evidence of their responsibility would invite disaster. Firemen should be of a mechanical turn of mind, and ambitious to become enginemen; there are

plenty of young men with these qualifications, and it is a waste to employ any others; they make the better firemen, of course, from their hope of advancement.

In filling vacancies, the best general policy is to promote deserving employès whenever there are such who are competent for the positions, and to fill up the ranks of apprentices in shops, stations and offices, as well as other minor appointments, from the families of old employès, so far as possible. The children of employès are in a sort of apprenticeship from their birth; they have opportunities for learning many details which others can only acquire after a considerable period of service; they are already attached to the road and its managers, if the management has been just, and this attachment may be of great value to the company; it is an inducement to continuous and faithful service if the employès understand that these chances for a start in life are reserved for their children.

It does not admit of doubt that good service may be more promoted by rewards than by punishments; yet fines imposed for carelessness are a legitimate and effectual penalty, if due care is taken not to impose them unjustly, and the men will recognize the fairness of paying them, if within their means. when by carelessness they have caused damage. Rewards, however, are more stimulating; premiums for savings on engines, for superiority in maintenance of track, and promotions of the most deserving, without favortism, encourage a generous strife for excellence. Heroic actions, or one of uncommon merit, should be acknowledged by a letter to the deserving employè, and it is all the better if accompanied by a small present in money. Such tokens of approval have been dear to men always; the railway employè like to show them, as a soldier does his medals.

Discipline is only maintained by careful attention to small details. The experience of armies shows that men do not fail in the important things until they have become negligent as to the less considerable. A superintendent, supervisor or foreman must therefore be continually looking for the small defects if he hopes to avoid the larger; nothing which is not exactly right should pass without remark; nor, if not immediately corrected, without a louder remark. It is probably not necessary to say that if the superior officer keeps his temper, under whatever provocation, his determiuation to require perfect obedience will be more manifest and more felt than if he falls into a passion; at the same time he will be more comfortable himself.

The condition of enginemen and firemen, of conductors and brakemen, is apt to be forlorn when they are away from home; some provision should be made for them to sleep and eat in comfort; and a sitting room where they can pass the dreary hours of waiting, amused with games or the newspaper, is necessary, if it is not preferred that they shall haunt the taverns. These arrangements can be made self-supporting, but the company must take the initiative and furnish a suitable building, which may be let to a landlord who will keep it upon terms dictated by the company, if that is thought best.

Employès associations for any purposes, as for club-rooms, hospitals, insurance, lack the most important condition of success, which is a promise of permanence. Any employè, or a considerable number of them, may leave the road at any time, and the society may fail suddenly from want of support, or the employè may cease to benefit by his contribution because of his own removal; it is, therefore, important that the railway company should be a subscriber to, or guarantor of, such associations as it would wish to encourage. So far as experience goes, it appears that the men are less interested in libraries and reading-rooms than in reasonable bodily comfort while living, and in benefits to their families in case of death or injury, and a judicious manager can secure the hearty co-operation of the employès in any well-conceived undertaking which has these ends in view.—*Railroad Gazette.*

A SUBSTITUTE FOR POOLS.

RAILWAY managers would very much like to discover a substitute for pools, some plan that would possess superior advantages and yet be free from the acknowledged defects of the present system. But heretofore the only feasible method of dividing the traffic and thereby maintaining rates has been by means of pools.

Of late, in view of the pool entanglements and troubles, the suggestion has been made that the English system of a clearing-house for freight and passenger revenues be adopted. This plan is on the basis of dividing the traffic itself.

At the outset let it be stated that either system is open to the same legal objection of being a contract in restraint of trade and therefore unfavorably regarded by the courts. We apprehend, however, that, if it could be sufficiently shown that pooling or clearing agreements were necessisities and essential for the safety of competing railway lines, the courts of last resort would reverse their innuendoes and *obiter dicta* as to their illegality. Judge Cooley, who is a splendid authority, inclines to the view that, if tried by the test of ancient precedent and decision, these pooling contracts would be rejected; still we believe that if the case were to be well argued there would be a disinclination to weigh the living facts of the present in the decayed and musty scales of the past.

Tonnage pools have serious disadvantages from which the clearing-house system would probably be free. It may here be said that this latter plan is much like that used by banks, which send the checks received by them during the day to a place of exchange, the authorities of which adjust the amounts and, giving to each the drafts that are drawn on it, pay or receive the balances. Now, if three, or four, or ten railways were members of a clearing-house, similar in general characteristics to that formed by banks, each would send in every day the way-bills issued by it and this central authority would check up the charges called for by these way-bills and at stated times divides it in agreed proportion, and the railways reporting more than their proper share would pay the excess to the clearing-house, which money would be paid over to the roads carrying less than their share.

It will be seen that such a scheme makes no allowance for freight charges not collected, nor for rebates or reductions given to shippers. In this last respect is one of the principal advantages of the new system, for what road would be willing to make deductions for which it should receive no credit? If the motive for a deed be taken away it will not be done. So with this cutting of rates, which pools have not heretofore been able to

end, if no advantage is to be gained by making concessions the tariff is likely to be strictly maintained.

Pools in many instances are nothing more or less than bribes to small roads to maintain rates. If the clearing system were to be adopted a better check could be had upon these unruly beneficiaries.

The difficulty after all arises from the lack of intelligent coöperation among railways. Instead of perfect confidence there is often, and justly too, mutual distrust and suspicion. The history of pools is a record of agreements ruthlessly violated, of contracts disregarded, of subterfuges and of an underhand writhing out of burdens willingly assumed. This may be a severe arraignment, but all who know anything at all of the operations of railways are aware of its truth. There was often some excuse for actions that were open to condemnation, but there is no longer any reason why a reform should not be inaugurated.

If pooling agreements or clearing contracts could be honorably observed, doubtless either would answer the purpose sufficiently well; but always there is some road that believes it can do better as a free-lance and so virtually becomes a railway Ishmaelite—its hand is against every one and the hand of every one is against it. With a difficulty such as this it is hard to deal. Even the leading and influential lines, which, if thoroughly united and resolved upon any one course, could enforce it, are wary and noncommittal. What can be done under such circumstances?

It is foolish to expect that as long as this state of affairs exists a mere substitution of a clearing system for pools would be of any material advantage. Such a change would be a novelty—nothing more. We must go deeper and see that the foundations are substantially prepared and then an edifice can be erected that will be durable.

We incline to view that a wise clearing system would be an improvement upon pools, for by it a more thorough discipline can be enforced and the operations of the road kept under more effectual supervision. It is necessary to have this centralization, for railways must, like individuals, who surrender part of their natural prerogatives to a central government in order to make the remainder more secure, be willing to give up some of their independence so that they may realize greater returns to their owners.

Before the clearing system could be put in operation there must be a most genuine and thorough conversion on the part of all who heretofore have acted in a way that in private life would be looked upon as dishonorable, for all must be willing to be honest and faithful to promises. After such an experience as those now in charge of our railways have had they will naturally be reluctant to believe in this conversion. Men who have been inflexibly honest and honorable in their private life have felt that in managing railways they must fight the devil with fire—in other words must meet subterfuge with prevarication and fraud with concealment.

The person who supposes that all this is to be changed in a day, or by merely wiping out the record of the past and beginning over again, is indeed simple and upsophisticated. The work of regeneration will be a long and weary process, and the delays and discouragements will be numerous. Yet, no one can either say that the task is impossible, or that it ought not to be forthwith undertaken.

When railway officials of advanced ideas and earnest purpose shall undertake to bring about a combination for the purpose of operating railways on the basis of absolute integrity and honor, it will be easy to take up any of the various plans for coöperation that may be fixed upon, and carry it out to a successful issue.

In the discussion of all theories the present condition of affairs and the individual circumstances that surround railway officers must never be overlooked.—*Railway Register*.

Heavier Rails Needed.

SINCE steel rails were introduced the railway companies have continued increasing the size and weight of their rolling-stock, and the speed of trains has also been materially accelerated, till the rails which carried trains safely ten years ago are not, according to the *American Machinist*, sufficient to endure without danger the blows from the cars or locomotives now in use at the speed the blow is struck. Although trains in Great Britain maintain a higher average speed than those run on American roads, accidents from broken rails are almost unknown there, the cause of this exemption from breakage being due to the great weight of rail employed. While our leading railways are using rails weighing from 50 to 60 pounds to the yard, British roads doing similar work have rails weighing from 65 to 85 pounds to a yard. American engineers assumed that steel rails could not be overloaded by ordinary railway locomotives or cars, and they introduced rails that were too light in the first place, and the breakages due to inherent weakness are now manifesting the mistakes made. There are thousands of miles of railway track laid with steel under 60 pounds' weight to the yard. Every train that rolls over this track takes part of the steel away, so that the rails are getting smaller and weaker every year. As this weakness grows, the increase of accidents from breakage will go on. The interests of safety already demand that the steel rails on many roads should be renewed with heavier patterns, or that the weight of locomotive drivers and cars should be reduced.

Military Utility of the Railways of India.

MR. EDWARD KIMBER, says the London (Eng.) *Railway News*, in his address on the 20th of March, to the Popular Scientific Society at the Royal Aquarium, Westminster, pointed out that the different Indian princes see in the yearly increase of railways a facility of concentrating troops of which they and their ancestors have never dreamt. The East India Railway, of 1,500 miles, dominates the northeast of India as far as Simla, in the north, and Jubbulpore in the south, while from Simla, round to the Afghan frontier, down to Kurrachee, on the west, the Indus Valley Railway, of 509 miles, completes the northern defence of the country, and enables 100,000 troops to be thrown upon any point of 2,000 miles run within a few days. The Bombay Baroda and Central Indian Railway, of 438 miles, protects the wealthiest and most valuable part of the west coast; while the great Indian Peninsula Railway of 1,288 miles, strikes upwards through the country to Indore, Khandwa, Nagpur, and Jubblepore. The Madras and South Indian Railways, of 1,514 miles,

stretch across from the east coast towards the west, through Bellary, and join the Bombay system. Their ramifications to Bangalore, Beypore, Trichinopoly, and Tuticorin make them practically the commanders of the whole south. The Scinde Punjaub and Delhi Railway, of 663 miles, the Rajputana, of 1,116, and the Northern Bengal, of 280, belong to a system of scientific railway strategy, the value of which would be demonstrated immediately were there another mutiny or an active Russian aggression on the Afghan frontier. These railways not only enable the British garrisons to keep the semi-barbarous native states in order, but should these states be able and willing to furnish contingents, as many of them are, to resist the Russians, these forces can be pushed on to the frontier with the greatest ease and dispatch. The great strategic lines are for the most part completed, but there yet remains a great deal to be done in the direction of lines which would not only pay a good dividend from local traffic, but which would in case of need be useful for the transit of troops. The science of railway strategy has been brought to a perfection in India it has not attained in any other country.

Railways Superseding Canals.

SOME ten years ago Mr. Edward Crane defied the Massachusetts Legislature and the railway men of the State of Massachusetts with a declaration that railway transportation would yet be made cheaper than water transportation, and that railway competition would drive out lake and canal transportation. In the last quarterly report of the Treasury Review of Statistics (page 418) it is shown that the tonnage transported on the New York State canals has fallen from 6,442,225 tons in 1868 to 5009,488 tons in 1884, while the tonnage on the New York Central and Hudson River Railroad has increased in the same time from 1,846,599 tons to 10,211,418 tons; on the Erie road, from 3,900,000 to 11,071,000, and on the Pennsylvania, from 4,722,000 to 22,583,000. This is exclusive of the tonnage moved on the leased lines. The tonnage transported by rail on the four American trunk lines increased from 44,767,954 tons in 1880 to 53,549,316 tons in 1884.

Master Car-Builders' Association.

THE nineteenth annual convention of the Master Car-Builders' Association will be held in the Hygeia Hotel, at Old Point Comfort, Va., beginning on Tuesday, June 9th, at 10 A. M. The following is a list of the subjects on which it is expected that special reports will be made, and which will be discussed during the sessions of the Convention:

1. A Standard Form for the Treads and Flanges of Wheels.
2. Standard Freight-Car Trucks.
3. Brake-Shoes, Brake-Beams, and Interchangeable Parts of the Brake Arrangements of Cars.
4. Standard House-Car to Carry 60,000 pounds of Lading.
5. Standards and Appliances for the Safety of Trainmen.
6. Passenger-Car Framing and Trussing.
7. Automatic Freight-Car Brakes.
8. Freight-Car Roofs.
9. Trap-Doors in the Roofs of Passenger-Cars.
10. Side-Dumping and Drop-Bottom Coal-Cars.
11. Standard Dead Blocks.
12. The comparative advantages of the two methods of constructing freight-cars, with and without Platform Timbers or End-Sills projecting from the end of the car.

A meeting for the revision of the "Rules Governing the Condition of and Repairs to Freight-Cars for the Interchange of Traffic," will be held on the first day of the convention, Tuesday, June 9th, at 3 P. M.

A special meeting has also been called by the Executive Committee of the Association for the consideration of "the automatic coupler question." This meeting will be held on Wednesday, June 10th, at 3 P. M., and all railway mangers, general superintendents and railway commissioners have been invited to attend to take part in that meeting, or to send a suitable person to represent them.

Privileges of French Railway Employes.

THE employés of French railways have certain peculiar advantages according to the following paragraph taken from an exchange, but it should be remembered, on the other hand, that their pay is far smaller than that of American railway men:

Employés of French railways have exceptional privileges over English, German or American railway men, such as reduced rates of freight when consigned to them, and an unusual number of personal passes. The company will also supply them with provisions and wines of all sorts at the lowest wholesale rates, and if stationed at points where such articles are exceptionally dear, where the company cannot conveniently keep storehouses, they receive certain additions to their wages, expressly designated as an indemnity to meet such cases. They are allowed to purchase their fuel at the same rate as that paid by the company, while in the case of sickness they are attended by the company's physicians and supplied with medicines gratuitously. Besides, the French companies allow what are called "primes" to all engineers and firemen for economy in machinery and fuel. The orphans of all employés killed while on duty are placed in orphan asylums at the expense of the company and are kept there until they are seventeen years old.

Railway Sanitation in New Jersey.

THE State Board Health of New Jersey has sent out circulars, of which the following is a copy:

To the Officers of Railroad and Transportation Companies of the State of New Jersey—Gentlemen: The State Board of Health of New Jersey has the honor to address you in the interest of public health in this State. Not only because of anxiety as to the possible introduction and spread of cholera, but of the intimate and constant relation between public conveyances and the spread of disease, we earnestly advise an expert sanitary inspection of all the property belonging to your respective companies.

We are aware that some of the very best methods of

structural arrangement and management are illustrated in some of the cars and stations of the various lines of railway. We are also aware of defects and neglects that are a menace to the health of the traveling public, and to the localities in which the buildings of your respective companies are located.

The attention to rooms, cesspools, closets, water supply, etc., too often devolves upon those not capable of skilled oversight, and not acquainted with thorough modes of construction, cleansing and disinfection. In times of epidemic these public places are especially hazardous. At all times they are subject to such general and frequent use as to make it needful to have a very watchful care and some system of inspection.

At a meeting of this Board, held at Trenton, this circular was directed to be transmitted to the officers of all companies doing business in this State.

By order of the Board.

E. M. HUNT, Secretary.

Dr. Hunt has heard from the representatives of the different companies. All appreciate the action of the Board, and intimate their willingness to do whatever is practicable in the way of such improvement as is suggested. President Roberts, of the Pennsylvania Railroad Company, wrote that he would call the attention of the officers in charge of the properties to renewed vigilance in the matters to which the Board refers, and he would be glad, whenever the officers of the Board in any way discover any defects, if they should promptly point them out.

Railway Wages in Missouri.

THE report of the Commissioner of Labor Statistics for Missouri shows that there are 19,486 railway employés in that State, whose yearly earnings average as follows: General officers, $4,524; assistant and division superintendents, $2,400; civil engineers, $1,844; master mechanics, $3,000; masters of transportation, road-masters and bridge foremen, $1,440; clerks, $732; machinists, $810; passenger conductors, $1,056; freight conductors, $1,080; passenger engineers, $1,080; firemen, $660; wipers, $432; baggagemen, $600; brakemen, $684; station agents, not telegraph operators, $684; station agents, also telegraph operators, $684; telegraph operators, not station agents, $650; carpenters, $780; section foremen, $507; section men, $507; laborers, $343; switchmen and watchmen, $480; bridge tenders and pumpers, $420, and other employés, $592.

Common Sense Ventilation.

"AIR is like a rope," remarked a mining engineer; "you can pull it better than you can push it. All mechanical appliances for pushing air into a room or house are disappointing. What we need to do is to pull out the vitiated air already in the room; the fresh supply will take care of itself if means for its admission are provided. It has been usual to withdraw the air through openings near the ceiling—that is, to carry off the warmer and therefore lighter portions, leaving the colder strata at the bottom of the room, with their gradual accumulation of cooled carbonic acid undisturbed. Much the better plan would be to draw this lower air out from a point near the floor, allowing the upper and warmer portions to descend and take its place. An open fire with a large chimney throat, is the best ventilator for any room; the one-half or two-thirds of the heat carried up the chimney is the price paid for immunity from disease; and large though this seems, from its daily draft on the wood-pile or coal-bin, it is trifling when compared with doctors' bills, and with the loss of strength and efficiency that invariably result from living in unventilated apartments."

Durability of Steel Rails.

THE durability of steel rails is discussed by Mr. Webb, of the London and Northwestern Railway, who states that, according to his calculations, 1,400 pounds of steel disappear every hour from the track of that company's lines, 1,780 miles in length. At first glance this seems a surprising statement, but it is only $\frac{7}{10}$ ton each hour, or 16.8 tons a day, or 6,132 net tons each year, for a line of 1,780 miles, having an exceptionally heavy traffic. In length the railways of this country are 71.3 times that of the London and Northwestern, and at the same rate of destruction by wear the quantity of steel rails required for replacement on all the roads of this country would be only about 438,000 net tons. The consumption of rails in 1883 in this country was about 1,400,000 tons, of which 6,500 miles of new road required perhaps 650,000 tons, leaving 750,000 tons for replacements of both iron and steel. It may be inferred that the destruction of rails by wear on the London and Northwestern is not relatively so great as it may be on many roads in this country.

Electric Lights for Cars in Germany.

SOME trains on the Frankfort-Fulda-Ulm Line are now fitted up with a dynamo placed in the baggage-car on one side and accumulators on the other side. The dynamo, if driven at 750 revolutions, gives a current of twelve ampères, which by an automatic switch is sent into the accumulators. The dynamo is driven from one of the axles of the van, in a similar manner to the plan adopted on the London, Brighton & South Coast trains. The cost of installing the plant is given at $600 for dynamo, driving-gear, and accumulators, and at $16 to $20 per passenger-coach. The light itself is estimated to cost 1.7 cents per lamp per hour.

A FEW weeks since the Russian Minister of War signed a contract for the immediate delivery of steel rails to the value of £149,000, for the Transcaspian Railway. They are intended for the section of the line from Kizil Arvat to Askabad, and will be laid down in a few months. It is this railway that the Russians propose ultimately extending to India.

STATEMENTS that the Baldwin Locomotive Works contemplate moving to some point outside of Philadelphia, are contradicted by the firm. An elegant and substantial building has been erected at Broad and Hamilton streets as an addition to the works.

THE steel works of the Edgar Thompson Company, at Braddocks, Pa., have announced resumption in all departments, giving employment to over 3,000 men who have been idle since early in December.

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Principal Contents of this Number.

CONTRIBUTIONS.

(*Written for the American Railroad Journal.*)

EDITORIALS.

MISCELLANEOUS AND SELECTED.

STREET-RAILWAYS.

NEW INVENTIONS.

THE ST. LOUIS TIME CONVENTION.

THE report of the recent General Time Convention, held at St. Louis, on April 5th, affords interesting reading, not only to railway men, but to the general public. After inspecting the pages of this report, and noting the countless subjects and minutiæ of detail comprehended by the discussions, one is forcibly struck by the wonderful advances railway management has made, and by the rapid strides it is taking to reach the dignity of a science. The title of the convention is somewhat of a misnomer, for while "time" plays a leading part in its discussions, in reality the tendency of the convention was to establish fixed rules and formulas for the guidance of railway managers and employés, and to adopt a general system for the whole country.

A glance at the captions of the topics discussed will show the scope of action of the convention, and illustrate the systematic efforts of railway officials to conduct their roads on uniform principles, founded on common-sense, and possessing the exactitude of a science. Commencing with "Standard Time," the convention proceeds to the discussion of "Classification of Trains," "Freight-Train Regulations," "Conductors and Brakemen," "Engineers and Firemen," "Section Foremen," "Yard Men," "Train Orders," and under each topic a number of questions are put forth, with answers tabulated according to the number of miles of road under the control of the officials replying to the queries. While it is true that all or nearly all of the questions have a direct or remote bearing upon the time question, the general nature of the questions indicates that the gentlemen attending the convention were desirous of collating a fund of general information relative to American railway management, with a probable view to uniformity; and the wide variation of methods now practiced as shown by the answers received tends to prove that little uniformity exists at present. In the case of important queries, where the answer is a simple negative or affirmative, there is a surprising equality in the number of answers of each description; while where the questions are asked to obtain a direct statement as to methods and rules employed, there is an equally surprising diversity of replies. A state of affairs is thus shown that urges the adoption of a general system, and suggests the idea that up to the present time railway management has had much of the experimental about it.

While every road possesses a certain individuality that would necessitate special rules, this specialty invariably appertains to the smaller details of management, and in matters of weighty importance there is no reason why a uniform system should not be obtained. The combined wisdom of the railway managers should be followed by the evolution of such a system, and our railway business should resemble the government of the country, in so

much that every railway should make laws unto itself in matters applying purely to itself, while acknowledging general laws applicable to railway management in the abstract. The combination of such a system of general government with the peculiarity of a species of "State Sovereignty" would be a great accomplishment which we yet hope to see achieved. The forty-six representatives of the twenty-six railway lines, present at the convention in question, have started a movement in the right direction, and their further labors, augmented, we hope, by an increased attendance at future conventions, will be awaited with interest.

The committee appointed to examine and tabulate the replies to the various questions propounded, have concluded their labors by recommending a number of rules for general adoption under each general department of management, and the utility of the convention can be determined by watching the roads to ascertain if these recommendations will be followed. Probably it is not feasible for all of these general rules suggested by the committee to be put into immediate operation, but as far as practicable the system they recommend should be afforded a fair trial, and an incentive thus given to the furtherance of the cause of railway science. It is, moreover, safe to say that if all the roads represented at the convention follow the recommendations of the committee, the general adoption of the classified rules and regulations will be but a question of a very short time, for these roads are the representative lines of the country.

We regret that we did not receive the report of the committee in time for us to publish extracts in this issue of the JOURNAL, but in subsequent numbers we shall enter thoroughly into the subject, and publish the recommendations of the committee in full.

RAILWAYS AS CARRIERS OF CONTAGION.

OPINION differs, both lay and professional, as to the probability of a cholera epidemic in America this year, but there is a sufficient precedent to warrant the belief that we shall not escape without a touch of it, even if it is stamped out before it reaches the proportions of an epidemic. Certain it is, that if the dreadful disease reaches these shores, it will be through the medium of trans-Atlantic vessels; and equally certain is it, that if it penetrates into the heart of the country it will be through the medium of railways. Cholera is known to follow lines of travel, and should it resist the efforts of local sanitation and medical skill, and prove a national scourge, the railways will be the medium through which it finds its victims. This is a plain truth which cannot be contravened, and without an utter cessation of railway travel, both passenger and freight, the spread of cholera, should it resist local measures, cannot be averted.

Of course the business of railways will continue just the same and perhaps will be increased through the real or fancied fears of persons flying from infected districts, and therefore, to an unavoidable degree, the railways will be vehicles of contagion; but the public have a right to insist that while the railways must perforce be the indirect agents for spreading the cholera, they should forego no effort to limit their responsibilities in the matter to the unavoidable. Railway sanitation is now being thoroughly discussed for the first time, and if the cholera does come, a fine opportunity will be afforded to put it in thorough practice.

In the matter of carrying passengers who may bear with them in their system or in their clothing, the germs of the disease, the railways are practically powerless, and to almost the same degree are they in the matter of baggage and freight carriage. It will be impossible for railways to prevent the spread of the contagion through their agency by these means, and the public will not be disposed to attribute blame for such a disaster to them; but so far as their own premises are concerned the railways should be, and probably will be, held to a rigid account. Cleanliness in passenger-cars and stations, especially with regard to the water-closets, should be strictly maintained, and thorough disinfection resorted to at frequent intervals. The railway employés should also be instructed in the simple rules of hygiene, in order that they may know, not only *what* to do but *why* to do it. The time was, and not in a period of the remote past either, when for absolute uncleanliness and filth, the water-closet of the average passenger-train proudly bore the palm, and the same indispensable apartment appertaining to the passenger-station was not far behind. Considerable improvement has been manifested in this regard, but there is room for more, and the approach of cholera will be a powerful inducement for further attention in this direction. It should also be remembered that while it is highly proper that great care should be exercised in keeping the toilet-rooms of drawing-room and sleeping-cars in a state of cleanliness, from a sanitary point of view there is by no means the same watchfulness required in these vehicles as in the humbler conveyances—the ordinary passenger-car, and above all the emigrant-car. In the first place, it is fair to assume that the wealthier and well-to-do travelers who patronize the higher and more expensive class of cars, are a little more cleanly in their garments and personal habits than the poorer classes; and secondly, it is from the poorer classes, and especially from emigrants that cholera contagion is expected. Under these circumstances, and from a sanitary point of view, the amount of attention required in maintaining cleanliness and care in railway cars and stations, is inversely commensurate with the conditions and cleanliness of the passengers and occupants.

Another point that is worthy of attention is the exclusiveness of such apartments. The closets of railway-stations are generally open to the public, not only travelers but to anyone who has occasion to use them, and while in better managed roads, the doors of passenger-cars are locked when the cars are on sidings or awaiting departure at terminal stations, it is not infrequently the case to leave them entirely unprotected for hours at a time. Naturally they are extensively in use by tramps and other uncleanly persons, amongst whom the rules of hygiene do not obtain. It would seem wise for the railways to lock the doors of the closets in their stations, requiring the persons wishing to use them to apply for the key, and at the same time to exclude the general unclean public therefrom. The cars should be locked, and especially the closets, whenever they are unoccupied or upon sidings.

The various State boards of health are looking into the matter and numerous courteous letters have been addressed by the boards to the superintendents of railways, calling their attention to the importance of railway sanitation; but this is a matter where the railways should not wait to be instructed or informed. If they—the railways—are to be the medium for the spread of cholera, or of any contagious disease, it is their place to see to it that they are merely carriers of contagion on other people's persons and property, and that so far as the persons of those under their own control are concerned, and more especially their own premises, no failure nor laxity on their part shall contribute to the horrors of an epidemic.

EDITORIAL NOTES.

THE stockholders of the New Jersey Central have finally decided to manage the road themselves until the Philadelphia and Reading are able or willing to pay the dividend agreed upon under the lease of two years ago. The stockholders have been patient, and can hardly be blamed for their action, but there is a straw or two indicating the possibility of the absorption of the Central system by the omniverous Baltimore and Ohio. The rumor that the Pennsylvania was bidding for the control of the Central is emphatically denied, and it is stated that the managers of the latter road are perfectly willing that the Central should pass into the hands of their rivals, the Baltimore and Ohio. Such complacency, however, is not shown in Philadelphia, where a lively contest is in progress between these venerable lines over the Baltimore and Ohio's entrance to the city.

* * *

THE Suakim-Berber Railway which was to "smash the Mahdi" is to be abandoned. Somehow the Mahdi does not "smash" well at all, and he retains his rotundity of proportions despite the full-dress campaign of that eminent tin soldier, Lord WOLSELEY. We suppose that the railway will now go into the hands of a receiver, *a l'Americaine*, and would suggest the propriety of appointing the Mahdi to the position. Being well and favorably known in the Soudan, he might conduct the road with profit and charge a nickel to the Arab children for the privilege of riding on the line.

* * *

BUT England is not through with military railways yet, and is now pushing one in Afghanistan, while Russia also has a keen eye to the utility of railways from a strategic point of view. What a vast bearing upon warfare railways are beginning to have, and how unfortunate, or fortunate, that they were not sooner operated! Had NAPOLEON been furnished with a railway, who knows but what the face of the world would indeed have been changed, and the disastrous return from Russia be but the triumphal journey of a conqueror? But seriously, judging by the incapacity of British generalship, would it not be wise to confide the possible campaign in Afghanistan to English railway managers? It will probably be a mere question of railway construction at best.

* * *

THAT there is nothing new under the sun is evident from reading a recent paper submitted at the meeting of the Royal Asiatic Society, at Shanghai, China. In this paper it is announced that telephones were in practical use in China centuries ago, and mention is made of one CHIANG SHUNSHIN, of Huichou, who flourished in the Flowery Kingdom during the seventeenth and eighteenth centuries, as the inventor of the "thousand mile speaker." This ingenious device rivals the phonograph as a work of utility, and it consisted of a sort of fife in which communications were whispered, and subsequently released, though we are not informed of the precise method of accomplishing this interesting feat. EDISON and BELL are thus thrown into the shade—and possibly BARON MUNCHAUSEN.

* * *

THE committee appointed by the United States Senate to consider the much vexed question of Inter-State Commerce, lately held a session in this city and listened to the views and opinions of a number of prominent merchants and railway men. While they may not do much to further the advancement of Senatorial meddling with railways, they will learn a few things that may be of use to them. Prominent among the results of their session, it is hoped, will be the appreciation of the fact that there are a few persons in this world who know how railways should be run apart from the majestic legislator.

* * *

OF all the railway associations, and there are a number of them, there are probably none whose deliberations are

awaited with a keener interest than those of the Master Car-Builder's Association, and the Association of American Railway Master Mechanics. Both of these associations will hold their annual meetings next month, the former at Fortress Monroe, Va., on Tuesday, June 9th, and the latter at Washington, on Tuesday the 16th. The proximity of these meetings, both as to time and place, will probably insure a goodly attendance at each.

* * *

IT is a somewhat surprising fact that while the year 1880 was, from a railway point of view, one of the most progressive of years, the Massachusetts railways found last year much more so. Unfortunately the experience of Massachusetts is not that of the whole country. It is claimed that this good showing is attributable to the intelligent labors of the Massachusetts Railroad Commission, but a large number of persons are ready with the simpler explanation that it is "one of those things no fellow can find out."

Outing, a publication originally intended as the exponent of bicycling interests, has now grown to the proportions of a handsome monthly magazine devoted to recreation in general, and interspersed with readable poetry and fiction. The number for May is a beautiful one from an artistic standpoint, and the character of its contents excellent. In the matter of illustrations it compares favorably with any of our monthly magazines, and appears to be steadily improving.

The Alienist and Neurologist, a medical review issued quarterly under the editorship of Dr. C. H. Hughes, of St. Louis, is received, and contains a number of common-sense papers on the treatment of mental and nervous disorders. Among them is an exceedingly interesting article by the editor on the subject of "State Provison for the Insane."

THE familiar "bad boy" who is becoming a character in American literature, has apparently not subsided—at least so we learn from an amusing book published by J. S. Ogilvie & Co., of this city, in which his domestic adventures are chronicled under the title of "The Bad Boy at Home."

The Quiver, published by Cassell & Co., of this city, contains, as usual, a large amount of interesting and instructive reading, together with a number of handsome illustrations.

TWO new and interesting exchanges are acknowledged in the receipt of the *Railway News* of Philadelphia, and the *Photographic Times and American Photographer*, of this city.

The Railway Magazine is the title of an attractive little publication issued by Geo. E. Allen & Co., of Buffalo, N. Y., and devoted to travel and transportation.

Baldwin's Official Railway Guide for May, is received, containing the latest changes in railway trains.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

STREET-RAILWAY MONOPOLY.

HOWEVER much the public may decry monopoly, in the matter of street-railways they experience a positive and direct benefit if all the roads in one city are under the control of a single company. The actual ownership of the roads need not be vested in a single corporation, but the control of all being vested in a single management invariably is productive of good results so far as the traveling public is concerned. While not urging a consolidation of street-railway interests in our larger cities, we nevertheless, feel constrained to make the above statement in view of the fact that charters and franchises for new roads are often opposed on the ground that the promoters are already possessed of one profitable road, and that there should be no monopoly in street-railway operation.

In large cities street railways may be operated separately and absolutely independent of each other without detriment to the traveling service, chiefly owing to the reason that they are not brought in direct conflict with each other's interests and may cater to the needs of different sections of the cities; but in the lesser towns, where more than one or two roads are desirable, and yet the bulk of travel is not sufficiently large to warrant competition, it has been found not only more practicable from the traveler's standpoint, but also more profitable to the companies, to unite under one management, and supply the needs of the community without direct rivalry.

Especially is this the case where two or more lines operate in the same avenues of travel for a considerable distance. Under separate control, and each striving for the bulk of patronage, it is likely that the accommodation will be more than sufficient, and certainly more than can be made profitable. Cars of one line will lag purposely behind their schedule time with the intention of delaying the cars of a rival line and securing all the travel on the same street or avenue. As a result it is generally the case that the cars of the different roads will be "bunched" and travel in pairs or threes, while between these gregarious trips, disheartening periods will pass

during which the public have to walk. Such policy would seem suicidal, yet it is frequently pursued, and a large amount of travel is lost to all the lines in the eagerness of each to obtain more than its share.

Should, however, these competing lines combine under one management and control, and should each line be regarded as a separate money-making factor of a common treasury, the public can be better accommodated and the aggregate of travel will be greatly increased. The total number of trips can be considerably lessened, while the public requirements will be better served, for one car run every ten minutes is certainly a better arrangement for the public than two cars run every fifteen minutes yet following each other so closely that a single car would answer every purpose, and the economy in running expenses is reduced a very appreciable degree. Under one management several competing roads may be run with profit in a moderately large city, but under separate management such a result is doubtful, and it is highly probable that none will be found to afford ample profit on what may be termed local traffic, or in carrying short-trip passengers.

Another great advantage to be derived from the combination of interests is in the adoption of transfer tickets, by which passengers can travel to various points by being transferred from different cars, and while it is possible that a transfer system might be conducted between separate roads, it will never come into general use save where all the roads are under one control. In affording the public increased accommodation by the adoption of a transfer system, we should imagine the street-railways would open a profitable field of traffic with little extra expense, and having a common treasury there could be no question as to the division of payment for such fares.

From a purely selfish view that portion of the traveling public who oppose street-railway monopoly, or the control of more than one line by a single company, are making a great mistake. In every way their interests would be better served were such a monopoly to be put in force, and when they oppose it they are decidedly "barking up the wrong tree."

THE Philadelphia Courts have decided in a recent case, that when a passenger upon a railway goes upon the platform of a car in violation of the company's rule, he has no ground of action in case of injury. This is as it should be. When a road offers to carry passengers there is no reason why it should also be understood as acting in the capacity of a dry-nurse toward its passengers. If they persist in violating well-established rules and meet with injury, passengers have no right to plead the "Baby Act."

* * *

AN increase in the receipts of the New York and Brooklyn Bridge shows that the recent reduction of fare on the bridge-cars was productive of good results both to the public and the bridge. The next step of importance will in all probability be the abolition of the tolls for foot-passengers, which would seem to be a wise move. Certainly when one of the trustees suggests selling five promenade tickets for one cent, it strikes us as a good time to do away with the "cent" business altogether.

THE PROBLEM OF RAPID TRANSIT.

BY EDWARD E. R. TRATMAN.
[Written for the AMERICAN RAILROAD JOURNAL.]

THE recent decision in the case of the Irving National Bank of New York, against the Ninth Avenue Elevated road has again revived the opinion that the granting of the use of the streets for these roads has not been such a decided advantage as was first supposed; and the question again suggests itself: "What is to be the future of the 'L' roads and Rapid Transit in New York?" In this case, which it must be remembered, though now but a solitary one, may be taken for an example by owners of property similarly affected, the Bank asked for an injunction against the operation of the road in question on the plea of past and present damage to property and general nuisance. This was granted, and the damages sustained were assessed at a sum of over $10,000 including interest. If the road is to continue in operation, the company must avoid the injunction which it can only do by acquiring the property in question, for which a price satisfactory to the owners must be given, with the result that the company will be saddled with property it does not want, of which it has itself reduced the value as regards future use, and for which it will have paid in addition to the purchase-money over $10,000; while all this, though surely bad enough, is capped by the uncomfortable idea that by the time it has all been done and things settled in this one case, others may arise to disturb the harmony and form a continual drain upon the coffers of the railway company.

Companies which purchase the land required for their roads and pay compensation in the first place for damage to other property under the general railway laws, have, it is true, a considerably greater first cost than companies which build their lines after the manner of the New York elevated roads; but they have no subsequent suits for damages to property, and have the satisfaction of knowing that the resources will not be dipped into by compulsory purchases, at a high price, of property which will be almost useless when bought.

The multitude of lines which afford accommodation to the city and suburbs of London, England, are arranged after very different plans. The Metropolitan and Metropolitan District Railways are constructed almost entirely in tunnel or covered-way ("cut-and-cover") through the city section of their lines with occasional openings, some temporary and some permanent, on vacant blocks, companies' land, etc. They are laid out to tap the centers of business and pleasure, and the residential districts to afford communication with the main lines and territorial stations, and to accommodate the most important routes of city street traffic, which requirements they well fulfill. Owing to the shape of the city, these lines form a continuous belt of irregular shape with various branches and connections to all the main lines at their

large terminal stations and elsewhere; so that cars can be taken right from any trunk line to almost any part of the city. The North London Railway has a large portion of its lines, including its four-track branch into the very heart of the city, carried on a brick viaduct, the arches being leased as stores, stalls, etc. Small streets are crossed by the arches, and wider ones are crossed by iron-plate girders. Neither roads nor railways are allowed to cross other roads on a level but must go over, under or around. Of the vast number of main lines and their endless local ramifications which surround and penetrate into London, some few are in cutting with retaining-walls (property being too valuable to allow of earthwork slopes, excepting a few places where sufficient land was originally acquired before the ground became valuable), but the majority are constructed on high brick viaducts of which there are miles and miles, forming a complicated network in the outskirts of the city and the suburban districts. Nearly the whole of the city population lives outside, at distances varying from one to fifty miles, and the traffic over all the roads—inward in the morning and outward in the evening—is something enormous, the North London Railway alone despatching trains of twelve cars every few minutes during the busy hours, nearly every train then being filled to its utmost capacity, while the other metropolitan lines and the local connections of the main lines have about the same average amount of traffic.

The underground railways have proved a success in almost every way except ventilation; but were a new line of this character to be undertaken, this objection would very probably be obviated, for our knowledge of the principles of ventilation has greatly increased since those lines were built, and improvements are constantly being made in the manner of applying these principles to practical uses, while should electricity be adopted as a future motive power, this question would be considerbly simplified.

Vienna, in Austria, is about to construct an iron elevated railway, which, however, will not be laid through the streets, but will form a "circle" after the manner of the route of the London underground lines.

Considering the question of the motors, it is very evident that ordinary steam-locomotives are not suitable for the elevated lines on account of their noise and the amount of dirt and water they scatter over the roads. Compressed-air, gas, fireless steam-locomotives and other plans have been attempted but with little practical success. The cable system seems distined to a great future, but the plan which seems to offer the greatest advantages is that which has electricity for its motive power, either on the *storage* system in which the electricity is carried in "accumulators" in the car itself, or the *conducting* system in which the electricity is generated at certain points along the line and conveyed through rods running alongside or in the middle of the track, whence it is taken to the machinery attached to the locomotive and touching the rod. Street-cars have been worked by electricity on the former system and a short line of railway is in regular operation on the conducting system in the north of Ireland; while a project was brought before the notice of the writer not long ago to work a system of light railways on this plan, the electricity being generated by the natural water-power of the district. For underground roads it is far preferable to steam and nearly all other methods, and with it the Broadway Arcade Railway might be a practicable and successful scheme.

As to the rolling-stock for city railways, the English plan of having doors at the side has the great advantage of enabling a long, crowded train to be emptied almost immediately, since, when a train runs alongside a platform, there is a door to every ten passengers, while in a dock between two platforms, as is usual at terminal stations, there are two doors available, or one to every five passengers. The cars on the London railways average 28 ft. in length and 8 ft. in width, weigh about 8 tons (= 17,920 lbs.), and are carried by two pairs of 42-inch wheels on the ordinary English plan. They have five compartments, each accommodating ten passengers, five on each side, making a total sitting accommodation for fifty passengers to each car, though of course in busy times standing passengers increase this number about one-half. Probably a modification might be desired to combine the advantages of the American and English styles of construction. The trains are "close coupled" as a rule, that is, the cars are drawn close together and never uncoupled except for repairs, etc. Before leaving the consideration of the rolling-stock, I would say for the information of a correspondent of the January number of the JOURNAL, that the cars are for the most part roomy and well-furnished and well-lighted, gas being used on nearly all trains for distances up to ten or fifteen miles. Smoking compartments are used as such all the life of the car, and the windows are washed daily as anyone may know who has stood in one of the large yards and seen the gangs of men swarming inside and outside of the cars, washing, cleaning, brushing, dusting and polishing.

The London stations possess great advantages of accommodation over those on the New York elevated roads, for not one is without its separate waiting-rooms for men and women; its urinals, water closets (which should be considered absolutely indispensable in every case), and other conveniences, while the buildings are more commodious and substantial.

Comparing the underground lines, the iron elevated roads through the streets and the brick viaducts on the railway company's own land, the advantages would seem to be largely in favor of the latter. The companies have no lawsuits for damages to property after the road is built; the rent of the arches brings in quite a considerable sum; the ventilation is good; there is no obstruction or nuisance of any kind in the streets; ordinary locomotives may be used without being a nuisance; the noise is considerably less than on the iron viaducts of this city, and the route can be laid out with regard to favorable grades and curves, and to touch or avoid certain points, since it is not confined to the location of the streets, while heavy freight and general traffic can be accommodated, for all the traffic, local, through, mail, express, freight, etc., travel over the London roads night and day.

If, as has been suggested, the "L" roads cannot be regarded as a final solution of the Rapid Transit question, it would seem wise to consider the advisability of adopting a system of railroads on brick viaducts on land belonging to the railway company, since such a plan appears to comprise the greatest advantages for cost, conveniences and carrying-capacity.

THE LIABILITY OF STREET-RAILWAY COMPANIES FOR NEGLIGENCE.

BY O. S. BRUMBACK.

[A Paper read before the Convention of the Ohio State Tramway Association.]

(*Continued.*)

I. LIABILITY OF STREET-RAILWAYS TO THE PUBLIC FOR WANT OF CARE.

THE first division, liability to the public, we will consider under two sub-divisions: *a*, liability to passengers, and *b*, liability to those not passengers.

a. LIABILITY TO PASSENGERS.

Street-railways are what are technically called common carriers—that is, the law regards them as a partly public institution, granted special rights and power for the public benefit. And in return for these privileges, holds them to a special accountability for the fulfillment of their duties in a safe and careful manner. Chief among the special rights so granted to street-railways, is the right to carry passengers and charge a toll therefor. In so doing the law presumes a contract between the carrier and the passenger, that the carrier will transport the passenger carefully and safely, and to that end must exercise the greatest care.[9]

In this class of cases, then, where passengers are injured by the negligence of the railroad company, the proof of the injury establishes a *prima facie* case of negligence.[10] Passengers are, as it were, the guests of a common carrier, and, while it does not insure their safety, it must still exercise the highest degree of care and prudence in their safe transportation.[11] Nor can a common carrier restrict its liability for such great care by a special contract with a paying passenger. Indeed, it is questionable whether it could do so with a free-pass passenger,[12] being against public policy.

It has likewise been questioned, but not decided, in one Ohio case, whether a common carrier can be held to warrant the good conduct of a servant toward a passenger.[13] This same case, however, clearly decides that a railroad company is not responsible for the wrongful act of a servant *outside* the scope of his employment, as in this case, where the baggage-master struck a passenger with a hatchet.[14] This case is cited and approved in the case of *James Healey* v. *The City Passenger Railway Co.*,[15] where it is expressly stated that a company is liable for the excessive force and violence used by a car *driver* in ejecting a person for non-payment of fare, *provided he has any authority to collect fares;* so also a conductor.[16] As a rule, in ejecting a person from a car, no more force or violence must be used than necessary. Whether the car should be brought to a stop before ejecting the passenger is a question for the jury to decide under all the circumstances.[18] As a rule, however, the car should be stopped, or its speed so slackened that the person may leave it safely.[19] In other States where the question has arisen, street-railways are held liable for injuries to passengers caused by being compelled to stand on the platform when the car was crowded. While the company is not bound to provide seats, yet it must answer in damages if the passenger is injured without fault of his own by being compelled to stand on the platform.[20] Riding on the platform is not contributory negligence in itself,[21] but the passenger must place himself in as safe place and position as he can find.[22]

From these illustrative cases, we see street-railroad companies are bound to use the greatest precautions to keep their passengers unharmed. The cars, track, harness, and other paraphernalia must be kept in good repair, and servants must exercise the utmost diligence to prevent accident, for if injury should result to a passenger because of any lack of great care, and he should not be guilty of any contributory negligence, a good case for damages would be made.

b. LIABILITY TO THOSE NOT PASSENGERS.

To the general public at large, meaning all those who are not passengers, street-railway companies owe a far less degree of care, being what is generally denominated as "ordinary" or "reasonable" care, such as any reasonable man would exercise under the circumstances.[23] In the case of *Pendleton Street R. R.* v. *Shires*, Judge Brinkerhoff says: "Street-railroad employés are bound to the highest degree of care and prudence . . . . . with a view to secure the safety of their passengers. In respect to the members of the general public, (not being passengers), they are only bound to exercise what amounts, under all the circumstances of the case, to ordinary care and prudence."[24] This was a case where the team of horses got away from the car and ran over Mrs. Shires, greatly injuring her. In another case[25] the court says: "It is ordinary care for a street-car driver to watch his horses mainly, and to what can be seen in front without looking back. . . . . But if he sees any danger in other directions, it is his duty to stop." The rule of contributory negligence is alike applicable in these cases, as indeed, in most cases of negligence. The plaintiff who seeks to recover must be without fault. There is a exception in Ohio to this rule—in cases of children who have not reached the age of discretion—negligence is excused in them, care not being required of one so young. Even though the parent or guardian is careless in allowing the child to be upon the street unprotected, yet the company will be held liable if there was any neglect or carelessness on the part of its servants, although the child itself contributed to the injury.[26] So that here, again, *great care* must be exercised to prevent injury to children. In such a case the company can have no benefit of contributory negligence, and could only hope to show itself without fault, to avoid liability.

9. 19 Ohio St. 12.
10. 4 Bull 11; 38 Ohio St. 461; 1 Thompson Neg. 46.
11. 30 Ohio St. 451; 19 Id. 12.
12. 19 Ohio St. 13.
13. 19 Ohio St. 133.
14. 19 Ohio St. 110.
15. 28 Ohio St. 23.
16. 21 Ohio St. 518.
17. 3 W. L. G. 90; 32 Ohio St. 345.
18. 28 Ohio St. 23. Citing 118 Mass. 228.
19. 5 Allen, 557.
20. 1 Sweeney 298, 490; 34 N. Y. 670; 67 N. Y. 596; 33 N. Y. Sup. Ct. 392.
21. 87 N. Y. 63.
22. 36 N. Y. 135.
23. 8 Ohio St. 570.
24. 18 Ohio St. 225.
25. 1. C. S. C. Rep. 180.
26. 18 Ohio St. 399; 30 Id. 451.

(*To be concluded.*)

Electric Railways in San Francisco.

IT is expected that in a few weeks the Pacific Coast Electric Construction Co. will have an experimental electric road running from the Southern Pacific depot to the Union Iron Works at the Protrero, in San Francisco.

For some time past experiments have been made in this direction, and the plans are now said to be complete. The road will be similar to the cable-road, only, instead of a cable underneath the track, there will be a negative and positive wire. These, when brought together by the grip of the dummy, will complete the circuit and provide the motive power. When the car stops the wires will be released; thus the power necessary to drive the car will be saved while it is at rest. The generating machines are also so arranged that as soon as a car stops they will cease to generate the amount of electricity to propel the car. Should the experimental line prove a success, electricity as a motive-power will, no doubt, be adopted on many of the street-railway lines in San Francisco.

The St. Louis Cable Road.

OWING to the strong and apparently organized opposition to the one year's extension of time for completion of the work sought by the St. Louis (Mo.) Cable R. R. Co., the company recently discussed the advisability of withdrawing, forfeiting their bond and disposing of the material on hand. At a recent meeting however, between the cable company and the Railroad Committee of the Council, a through understanding was come to and all differences straightened out, mutual concessions being made. Grading was done for two blocks on Franklin avenue, the power-house is nearly completed, the engine and drum are made, and the steel "yokes" are being constructed at Pullman, Ill. The cable, weighing forty-five tons, has been delivered, and the cars are now in the shops of the builders, Brownell & Wright.

Steam Street-Car Motors in Londou.

STEAM-MOTORS for street-cars are coming into extended use in England, but have only just been introduced in London. The motors, which emit neither steam nor smoke, are built by Merryweather & Co., best known as makers of steam fire-engines. The line has some heavy grades, and is six miles in length. The cars are carried on two four-wheeled trucks.

Street-Railway Construction in Cincinnati.

THE Cincinnati Street-Railroad Company notified the Board of Public Works that Rees E. and George F. McDuffie on recently assigned their interest under ordinances and contract with the city in the right to construct and operate Street-Railroad Route No. 21 (the Warsaw Pike and Price Hill Route) to the Consolidated. They desire to proceed promptly, but say they are confronted with the difficulty of doing so properly by the condition in which the work done on Warsaw pike and Hawthorne street has been completed. The original contract requires a metal of sixteen inches, but the pike as completed has only nine inches of metal. This would cause the track, if laid, to stand three to six inches above the metal. They urge the board to have the stakes set for the railway to the established grade, and that the metal be at once provided to complete the street as the track progresses.

Street-Railways in Birmingham, Ala.

THE new line to the base-ball park in Birmingham, Ala., and on beyond to Lakeview, is progressing rapidly and will becompleted within two weeks. The track is laid with thirty-pound iron, as a heavy dummy engine is to be used on this line as motive power. The Georgia Pacific road is building a handsome brick structure on First avenue for its general officers. This road has just completed its repair shops and round house.

The Brooklyn Bridge Passenger-Railway.

DURING the busiest hours of the day cars are run upon the passenger-railway of the Brooklyn Bridge on a minute and three-quarters headway, ten trains of two cars each being operated. It is estimated that the railway could carry 6,000 passengers per hour if pressed, but during the busy hours, at present, not over 4,000 are carried hourly. The reduction of the fare upon the cars from five to three cents has resulted in a consideralbe increase of travel and also in the receipts, the latter being forty per cent. greater than before the reduction.

STREET-RAILWAY NOTES.

ANDREW TRIMBILL, secretary of the Ewing Avenue Street-Railway Company, of Chicago, which has been granted an ordinance by the village trustees to construct a street-railway in South Chicago, states that the company has begun work on the construction of the line. Ties are being laid along the proposed route, and the rails are on the way from Cleveland, Ohio.

THE first cable-car over the Ninth street incline of the new street-railway in Kansas City, Mo., descended recently on its trial trip to the Union depot. The test was entirely satisfactory, and the road will shortly be opened for business.

ATTENTION is called to an advertisement in this issue of the JOURNAL, of the Peoples' Passenger Railway Co., of Philadelphia, in which the company offer a number of street-cars for sale.

IN the department of New Inventions of this month's JOURNAL, is published the description of an improved fare-box for street-cars.

THE cable railway of the North Hudson County (N. J.) Railway Co. is expected to commence running by July 1st.

A NEW cross-town line from Hamilton ferry, Brooklyn, to the bridge, is to be constructed by the Atlantic Avenue road.

THE Philadelphia City Passenger-Railway has been, leased to the West Philadelphia Railway Co.

THE Fonda (N. Y.) & Fultonville Street-Railway has been abandoned and the tracks removed.

WORK is shortly to commence on a street-railway in Oswego, N. Y.

THE Brooklyn Elevated road is now in successful operation.

A NEW street-railway is to be built in Charleston, S. C.

New Inventions.

Vaughan's Car-Coupling.

FRANK VAUGHAN, of Elizabeth City, N. C., has recently invented a new form of car-coupling, the construction and operation of which are shown in the accompanying cuts. Fig. 1 is a perspective view of a car provided with the coupling; Fig. 2, a vertical section of the link and spring through the line *x x* on Fig. 1, and Fig. 3 is a side view of the two couplings on different cars in the act of coupling, the draw-head being in section.

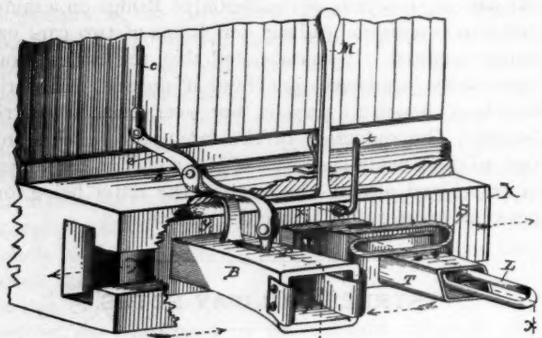


Fig. 1.

VAUGHAN'S CAR-COUPLING.

S is a spring, which may be of the coiled elliptical form, as shown, or spiral, or of other shape. This spring is firmly attached to one end of the sliding plate X, which is arranged in guides upon the ends of each car, and is adapted to slide transversely to the car, as indicated by the arrows in Fig. 1. B is the draw-head, which is attached to the sliding plate at its other end, and just beside the spring. In the draw-head are arranged U-shaped springs *f*, which extend back into the throat of the draw-head, and also outside and around the side edges of the draw-head, as shown. P is a coupling-pin, which passes through a slot in the top of the draw-head, and which pin is at its upper end jointed to the lever *e*, fulcrumed at *b*, and worked by a rod, *c*, to raise or lower the pin. T is a casing attached to the spring S, and in which is contained the butt-end of the link L. This link is connected to the casing T, and spring S, by a ball-and-socket joint, A, that allows the link to oscillate vertically or side-wise. Inside of the casing T are arranged springs *a a*, which hold or bring back the link to a horizontal position. The lower side of the casing T is by preference made a little longer than the upper, to sustain the link securely.

In making use of the coupling, the frame X, on one car is adjusted so that its link will be in the middle of the car, and the frame X, on the other car, is adjusted so that its draw-head will be in the middle of the car. Then as the cars come together the link L, of one car enters the draw-head of the other, and, pushing back the jointed coupling-pin P, allows the latter to fall through the link and couple the cars. Then when the draft-strain is exerted the lower end of the pin P, catches against a lug *l*, in the bottom of the draw-head, which lug holds the pin and prevents it from pulling out again. For moving the sliding frame X, from side to side any suitable mechanism—such as a hand wheel or lever, M—may be employed.

At *t*, on the frame X, is attached a signal rod, that extend up above the top of the car. At its upper end it bears a board painted red, and is designed to carry a red lantern at night, so cars may be coupled at night as well as in the day, only one red light being at the center.

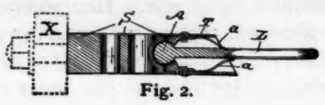


Fig. 2.

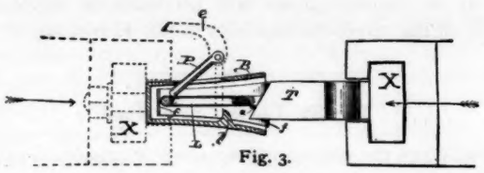


Fig. 3.

VAUGHAN'S CAR-COUPLING.

In practice the sliding frame X, should be stoutly made and strongly connected to the end of the car, or to the under side of the car near the end. To reduce a breaking strain on the spring S, stop devices may be arranged to come into action and relieve the spring when drawn out to a certain distance, as is frequently done in such cases.

Loveless' Spark-Arrester and Consumer.

CHAS. B. LOVELESS, of Worthington, Minn., is the inventor of a spark-arrester and consumer for locomotives which is herewith illustrated and described. The object of the invention is to provide simple and effective means whereby the gas, smoke, sparks or cinders from a locomotive are conducted back to the fire-box thereof and consumed, thus preventing the sparks setting fire to prairies or brush-wood along the line of the road, and also preventing the smoke and cinders passing into the cars; and it consisted in the peculiar construction of the smoke-stack, providing it with an independent conducting-pipe communicating therewith and with the fire-box of the boiler.

In the accompanying cuts Fig. 1 is a side illustration of a locomotive-boiler and fire-box partly broken away to show the conducting-pipe communicating therewith and with the smoke-stack; Fig. 2, a sectional elevation of the smoke-stack and conducting-pipe, showing it connecting with the smoke-box at the front end of the boiler; Fig. 3, an under plan view of the hood which forms the top of the smoke-stack; Fig. 4, a top plan view of the upper end of the smoke-stack with the hood removed, and Fig. 6, an under plan sectional view taken on line *x x* of Fig. 2.

A represents the improved smoke-stack communicating with the smoke-box B, of the usual boiler C. This boiler is of the kind ordinarily used in a locomotive-engine, and is provided at its rear end with a fire-box D. Immediately under the grate of the fire-box D, is a chamber E, with which communicates a conducting-pipe F, of any suitable size and diameter, this pipe passing up through the smoke-box and alongside the stack A, communicating therewith at its upper end. The upper end of the con-

ducting-pipe F, terminates in a funnel-shaped head G, which is secured to the rim *a*, of the smoke-stack A. At the rear of the rim *a*, is an elongated opening *b*, located directly opposite the funnel-shaped head G, and divided into two independent openings by a vertical partition *c*, which also divides the funnel-shaped head, as shown in Figs. 2 and 4. Upon the smoke-stack A, is suitably supported a hood H, provided with a perforated sheet-metal or wire-gauze screen I. This hood H, is so connected to the stack A, as will allow of its moving horizontally thereon in the arc of a circle to bring it in the direction of the wind.

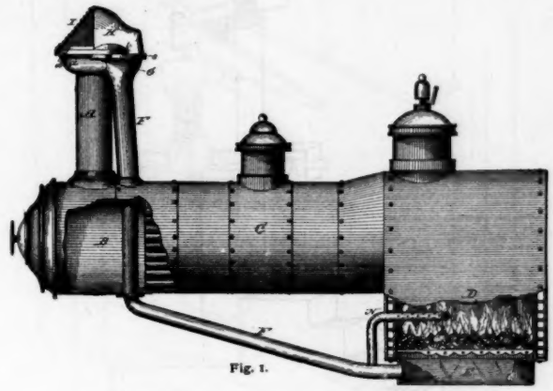


Fig. 1.

LOVELESS' SPARK-ARRESTER AND CONSUMER.

The hood H, is formed with a depending flange, *d*, which fits over the edge of the rim *a*, and also a similar flange, *e*, fitting over the edge of the funnel-shaped head G, which is provided with two or more friction rollers, *f*. A horizontal plate, K, of the hood H, bears upon the rollers *f*, thus enabling it to turn with comparatively little friction. The hood H, is provided with a central rod or spindle, *g*, which turns with it, and is supported by diametrical braces *h i*, connected to the interior sides of the stack A, the lower one, as shown at *i*, forming a step for the reduced end of the rod or spindle *g*, to turn on. The hood H, is provided with a concavo-convex deflecting plate, L, the concave or dished form thereof more effectually catching the smoke. sparks, or cinders as they pass up the stack and throwing them through the opening *b*, into the pipe F. The smoke, sparks, or cinders come in contact with a second deflecting-plate, M, arranged below the plate L, and rigidly secured to the rod or spindle *g*, so that it will revolve with it and give the sparks or cinders a chute laterally and into the opening *b*, as they pass up the stack from the smoke-box B. The plate or partition *e*, divides the funnel-shaped head G, into two separate conduits, each leading into the conducting-pipe F, as shown in Fig. 5, communication being had therewith through the opening *b*, and opening *k*, in the plate K. By this division of the head G, to form two conduits, the wind will strike against the partition *e*, and be driven down through the pipe F, thus preventiug its interference with the smoke, cinders, or sparks as it passes down the other conduit or on the opposite side of the partition; this being especially important when the wind is blowing in a direction at right angles to the direction in which the train is moving. The wind as it passes through the meshes of the screen I, into the hood H, catches the smoke, sparks, or cinders as they are thrown back by the plate M, and thus conveyed through the opening *k*, into the pipe F, from which they are conducted to the chamber E, under the fire-box B, and there consumed. It will be seen that the entire volume of smoke, gas, cinders, or sparks is thrown into the rear part of the hood of the smoke-stack, the wind being drawn in at the front thereof through the meshes of the screen, and not only carrying the smoke, gas, cinders, or sparks through the conducting-pipe to the chamber under the fire-box at the rear of the boiler, but supplying the necessary oxygen to keep up the combustion, a suction being thus created under the fire-box at one end of the conducting-pipe, while at the opposite end, the smoke, sparks, or cinders are being forced through it by the action of the wind. It should be understood that the speed or motion of the engine or locomotive, forces the wind into the hood of the smoke-stack, which conveys the sparks thrown by the exhaust-steam against the screen, back against the rear portion of the hood and into the conducting-pipe leading to the fire-box, the sparks being thrown by each exhaust of the steam against the interior surface of the screen, the suction created in the pipe drawing everything through it to the fire-box.

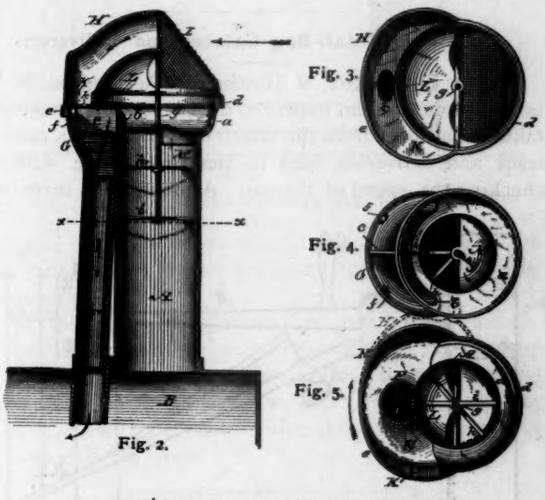


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

LOVELESS' SPARK-ARRESTER AND CONSUMER.

To consume more effectually the escaping products of combustion, the conducting-pipe F, is punched with a branch pipe, N, communicating therewith, and entering the fire-box D, some distance above the fuel, as shown in Fig. 1. The portion of the pipe N entering the fire-box may terminate in a T-branch, a spiral coil, or in any other suitable form found most desirable, and is closed at its ends, and provided with perforations, the object thereof being more effectually to distribute the escaping air mixed with gas and smoke which is unconsumed throughout the area of the fire-box above the flame, in order to ignite and burn up the products of combustion before entering the flues, in addition to that which escapes from the conducting-pipe into the chamber E.

The operation of the device is very simple as well as effective in consuming all products of combustion that would otherwise pass out of the smoke-stack through the meshes of the screen, the gas, smoke, cinders, or sparks as they pass up the stack A, being deflected against the

plate L, by means of the lower plate, M, the greater body of air which enters the cap or hood H, above the plate L, or upon the outside thereof, as indicated by the arrow, passing down the conducting-pipe F, and by so doing creating a suction, which draws the products of combustion through the opening *b*, and carries them with it to the point of discharge, as before described.

The products not drawn through the opening *b*, and which pass above and over the plate L, are carried by the incoming current of air down the pipe F, thus making provision for a complete conduction of the gases, smoke, cinders, or sparks, as they pass up the smoke-stack, to a point where they are consumed.

When the engine is not in motion, the draft and smoke may pass out at the top of the smoke-stack through the screen, provision being made under the fire-box to take in air to supply it when the engine is running backward or remaining stationary.

The device is especially designed for locomotives, but it may also be successfully applied to all classes of moving engines. Through the consumption of the unconsumed gases and other products, which is accomplished by the device, the inventor claims that a saving of twenty-five per cent. of fuel is effected.

De Lanoy's Mail-Bag Catcher and Deliverer.

HARRY DE LANOY, of Hasting-on-the-Hudson, N. Y., is the inventor of an improved device for simultaneously taking mail-bags from the cranes by the side of a railway track and delivering bags to the same crane, without checking the speed of the car. Although the invention

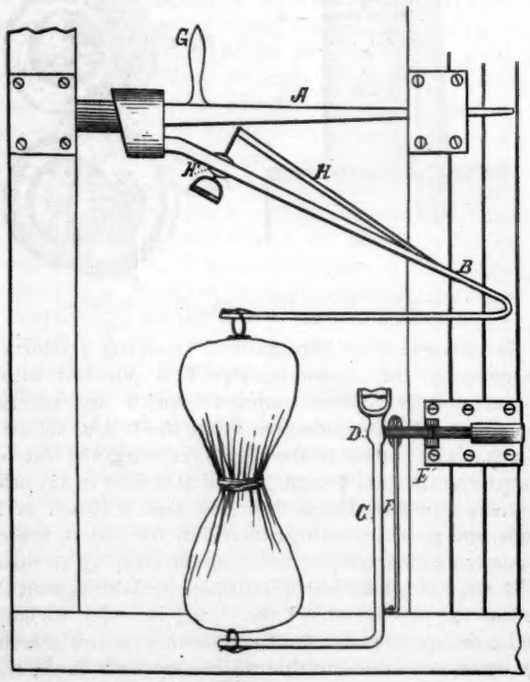


Fig. 1.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

is one of more interest to the Post-office Department as tending to save destruction of mail-bags, and the prevention of loss of mail matter, the adoption would also free the railway service of the danger to life and the destruction of property to which the present system of throwing the bags from the cars exposes the public and the railways, and is, therefore, of interest to the corporations. The device is simple as will be seen by the accompanying cuts and explanation.

Fig. 1 represents the bag on the car ready for delivery. The main bar A, similar in shape to the one in use, and which is used with and rotates in the same fitting now on the cars, has a catcher-arm B, with a rearward extension, at the extremity of which is a spring-clasp hook which holds the upper ring of the bag. The lower ring is at-

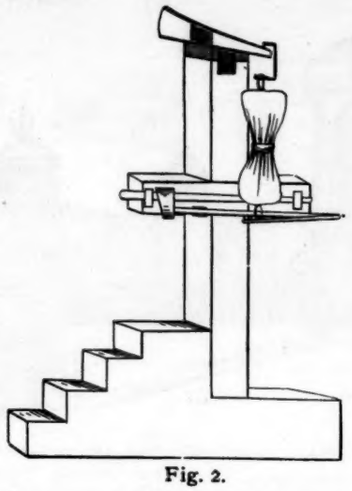


Fig. 2.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

tached to a similar hook at the extremity of the lower bar C, which extremity is brought within easy reach for attachment by the postal clerk on the car, by sliding through the sleeve D, and being slid back with the lower ring of the bag attached, into position, ready for use, as shown in the cut. The lower bar is held to the car by the socket E, with an additional support of a standard F, in which, and the socket, the lower bar rotates.

The lever G, being lowered inwardly by the postal clerk on the car, as shown in Fig. 3, the bag on the car is ready for delivery to the crane, upon which is attached a similar catcher, as shown in Fig. 2 (without the lower bar C, which, of course, is not needed), which represents the crane with the bag ready set for delivery to the car. The single act of the postal clerk on the car, of lowering the lever G, causes the exchange to be made automatically, the machine doing all the work of the exchange positively and without danger to the clerk or the by-standers in the car or on the ground.

The exchange is effected by the bag on the car going behind the bag on the crane, and being deposited in the catcher on the crane; and, simultaneously, the bag on the crane is taken from the crane by the catcher on the car, both bags being caught by the respective catchers, and securely held in each catcher by the long spring H, which, yielding to the pressure of the bag (the end of the spring working through a slot in catcher-arm at the point H,) aids in overcoming the inertia of the bag to some extent, and, after the bag has passed over it, the spring jumps out behind the bag where it is held without possibility of getting under the wheels of the car until released by, in the one case, the clerk on the car, and in the other, by

the local official on the ground. Fig. 4 shows the mail-bag delivered at the station, and Fig 5, a similar mail-bag caught by the car in exchange.

The machines can be applied to any car, using the fix-

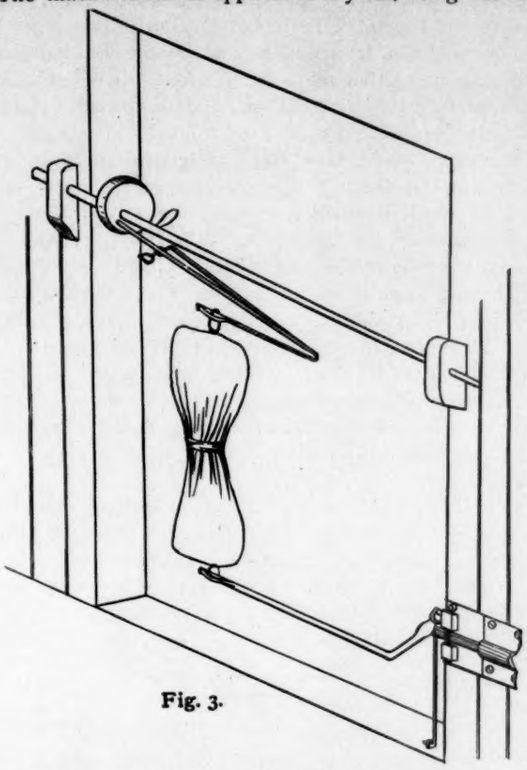


Fig. 3.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

tures now on them, by adding the one socket to hold the lower bar, and can be applied to any crane by substituting a cross-timber to hold the device, for the lower arm now on the crane which holds the lower ring of the bag.

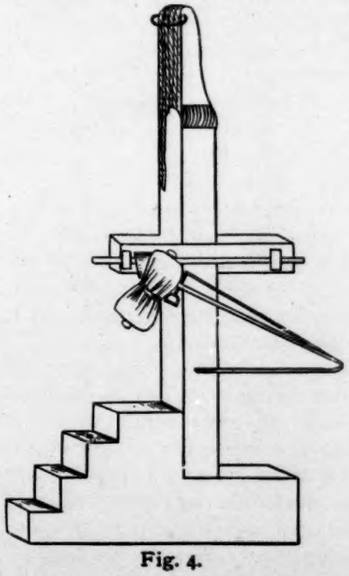


Fig. 4.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

Instances of destruction of mail-bags and mail matter by being cut up, are quite frequent, and cases, also, are known where the U. S. Mail has been missing from one to three days by being thrown out in blinding snow-storms and lonely catcher stations, and lost in snow-drifts and wayside bushes. The ability and intelligence of the Fast Mail Service clerks which have made the service justly famous, cannot guard against such accidents with the very imperfect appliances now in use, which were

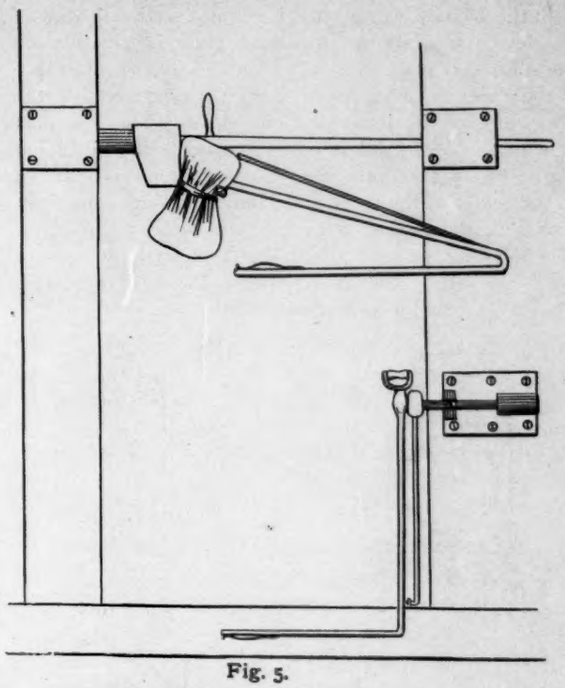


Fig. 5.

DE LANOY'S MAIL-BAG CATCHER AND DELIVERER.

designed to fill the needs when the trains moved at the slow rate of ten miles an hour, and the mails were proportionally light.

The De Lanoy device above described has had a satisfactory, continuous test at two stations on the Hudson River Railroad for the last five months, daily exchanging the regular U. S. Mail-bags weighing from ten to forty pounds, and with the train moving at the rate of thirty-five or forty miles an hour.

McCormick's Locomotive Head-Light.

JOHN R. MCCORMICK, of Austin, Texas, is the inventor of an improved head-light for locomotives, which is herewith illustrated and described. The object of the invention is to provide a head-light for locomotives that shall be movable either automatically by means of levers or gearing connected with the front truck under the locomotive, or adapted to be operated by hand by means of levers or gearing within easy reach of the engineer; thus enabling him to light up the curves before running upon them, or the straight track ahead, while turning curves.

The new invention consists in the combination, with a head-light of any suitable construction, of a movable plate to which the head-light is secured, a fixed plate, and suitable levers or gearing connecting this movable plate with the front truck of the locomotive, the moving of which latter in accordance with the curves over which it travels operating to move the plate supporting the light, whereby the light is automatically thrown in the direc-

tion required; and also in the combination, with a head-light, of a movable plate supporting the same, and a set of levers or gearing secured to the movable plate and extending to or within the cab within easy reach of the engineer, and by which the light may be turned in any direction.

In the accompanying cuts, Fig. 1 is a sectional view of the device securing the revolving plate in position on the stationary plate; Fig. 2, a plan view of the lower face of the upper revolving plate; Fig. 3, a plan view of the upper face of the lower stationary plate; Fig. 4, a plan view of the lever and pin which operate the revolving plate; Fig. 5, a top plan view showing the levers attached to the center of the truck and connected with the shaft conveying the motion to the revolving plate; Fig 6, a plan view showing the revolving plate connected by rods to the levers within the cab to operate the light by hand, while Figs. 7 and 8 show a modification.

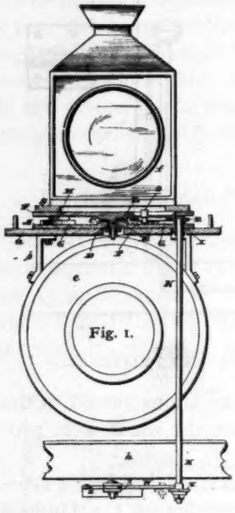


Fig. 1.

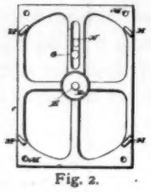


Fig. 2.


Fig. 4.

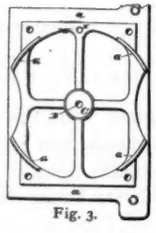


Fig. 3.

MC CORMICK'S LOCOMOTIVE HEAD-LIGHT.

A represents the stationary plate, bolted to a plate *a*, which latter is fastened to the brackets *b*, secured to the boiler *c*. If desired, instead of bolting the plate A, to the plate *a*, it may be rigidly secured to the brackets *b*, thus doing away with the plate *a*. The plate A, is formed with a central hub, C, centrally provided with a hole or perforation D, for the reception of the pin E, attached to or formed integral with the upper revolving plate, F, which latter is also provided with a hub L, on its under face, and bearing on the hub C, of the plate A.

Near each corner of the plate A, and on its upper face, are formed the upwardly-extending lugs or tracks G, the same being curved as shown in Fig. 3. The plate F, has also formed on its under face, and near the corners thereof, the dowardly-projecting lugs H, adapted to bear and move on the trucks G, and support the four corners of the upper revolving plate, F.

The head-light *f*, constructed of any desired pattern and dimensions, is rigidly secured to the revolving plate F, by means of bolts passing through the blocks *g*, and through the holes M, in the plate F, the latter being provided with a slot, N, in which moves the pin O, adjustably secured within the slot P, formed in the crank R. The crank is provided at one end with a hole, S, through which passes a set-screw adjustably securing the crank to the shaft K, adapted to transmit the motion from the front truck of the locomotive. The shaft K, passes through the hole I, in the plate A, to and through the platform *h*, and is secured to the crank T, the latter being provided with an elongated slot, U, in which is adjustably secured the pin V, formed on the end of the link W, which latter in turn is pivoted to the bar W', secured to the center plate, Z, or other suitable portion of the front truck.

From this construction and arrangement of parts it will be seen that when the locomotive enters upon the curve, the truck, in changing its position with relation to the boiler, moves the bell-crank W, accordingly, which, through the intervention of the crank T, and the vertical shaft K, and crank R, moves the plate F, supporting the head-light, in a similar direction to the front truck, thereby operating to throw the rays of light in the direction in which the truck is traveling, and as the pins E, and V, are made adjustable, the leverage can be so increased as to throw the light in and within the direction or circle of a curve for a great distance ahead of the locomotive.

Fig. 6 shows the devices whereby the light may be operated by hand. When it is desired to employ this device, the connection between the truck and the lamp, for automatically operating the latter, is removed or disconnected, and the plate F, on which the lamp is seated, is provided with the pieces *k*, to the outer ends of which

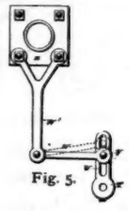


Fig. 5.

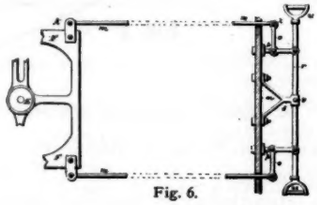


Fig. 6.

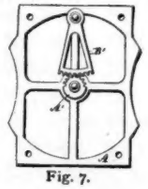


Fig. 7.

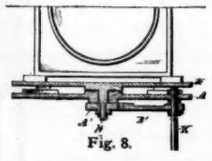


Fig. 8.

MC CORMICK'S LOCOMOTIVE HEAD-LIGHT.

are loosely secured the rearwardly-extending connecting-rods *m*, which pass through openings formed in the front wall, *n*, of the cab. To the inner side of the wall *n*, of the cab, is rigidly secured the bracket *s*, to which is movably secured the longitudinally-sliding rod or lever *r*, provided at each end with a handle *t*. To the inner side of the wall *n*, are also secured the bearings or brackets *p*, to which are loosely fastened the bell-crank levers *o*, one end of each of which is rigidly secured to the rod *r*, the outer end being fastened to the inner ends of the rods *m*, the lateral arms of the bell-cranks extending in opposite directions. The bracket *s*, if desired, may be provided with a set-screw *v*, adapted to impinge on the rod *r*, and lock the latter when it is desired to secure the head-light in a fixed position. By pulling either the handle *u*, the bar *r*, the latter will slide in the bracket *s*, and by means of the bell-cranks will move the rods *m*, in opposite directions, and thereby move the head-light supported

on the table F, and direct the rays to any point desired.

Figs. 7 and 8 show a modification of the devices for moving the head-light, in which A represents the lower face of the lower stationary plate, and F, the upper revolving plate, centrally provided with a downwardly-projecting pin *w*. To the lower end of the pin *w*, below the plate A, is secured the mutilated pinion A', with which meshes the segmental gear B', secured to the shaft K, below the plate A. It will be seen that when the shaft K, is turned it will, through the intervention of the gear and pinion, transmit its motion to the plate F, and thus turn the light secured thereon.

While especially designed for locomotives, the inventor claims that the head-light may be advantageously used upon other vehicles. The parts are so connected as to insure a positive movement of the lamp without danger of breaking, and the parts can be so adjusted as to turn the lamp the precise distance required.

Railway statistics show that 90 per cent. of accidents to trains happen on curves and at night, which percentage, it is claimed, will be largely decreased or cancelled by use of this invention.

The device is patented and controlled by F. E. Ruffini, of Austin, Texas, to whom the inventor has assigned the entire patent rights.

Dunn's Car-Coupling.

WILLIAM DUNN, of Hamilton, Ontaria, Canada, is the inventor of an improved car-coupling which is herewith illustrated and described. It consists of a hook for engaging the connecting link, which hook is provided with an angular hole at its pivot end, and lies in a suitable mortise or socket in the draw-head; and it also consists

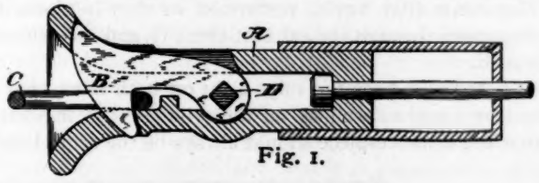


Fig. 1.

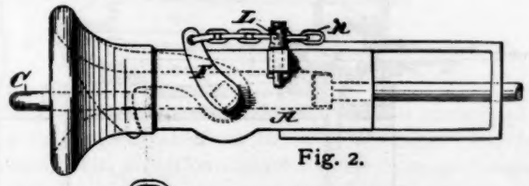


Fig. 2.

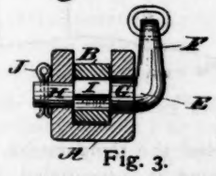


Fig. 3.

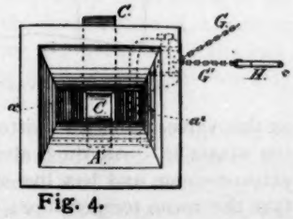


Fig. 4.

DUNN'S CAR-COUPLING.

of a crank-pin for holding the hook in place, this crank-pin being flat-sided where it passes through the hook to correspond with the angular opening in the hook, and to be rigid therewith, while its bearings in the draw-head are circular, the one next the crank-arm being larger than the angular part of the pin, and the one at the other end of the pin being smaller than such angular part.

In the accompanying cuts Fig. 1 is a central vertical setcion of the coupling Fig. 2, a side view; Fig. 3, a vertical cross-section through the crank-pin bearings; Fig. 4, a front view of the draw-head, and Fig. 5, an end view of a car with the coupling attached.

A represents the draw-head. B is the hook that engages with the connecting-link, C. D is an angular hole at the pivot end of the hook. E is the pivot-pin which holds the hook in place in the draw-head. F is the crank-arm on the end of such pin. G is the large circular bearing of the crank-pin in the draw-head. H is the smaller circular bearing of the same. I is the flat-sided or angular part of the pin which passes through the angular hole in the hook. J is a key for holding the pin in place. K is a chain attached to the crank-arm and running to any suitable place or connection, and is for lifting the hook; and L is a chain-pulley for guiding the chain, so that it shall lead from the crank-arm in the proper direction to lift the hook when pulled.

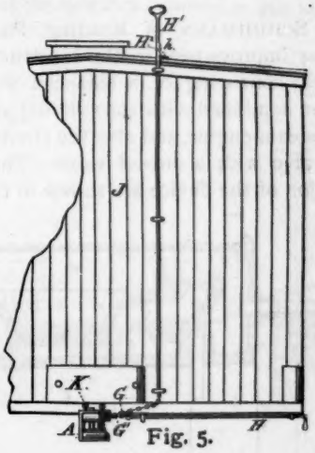


Fig. 5.

DUNN'S CAR-COUPLING.

It will be seen that the smaller circular end of the pin, in order to pass through the hook to its bearing in the draw-head, must be of less size than the flat-sided portion that is intended to be in the hook; also, that to permit the flat-sided portion of the pin to enter to the hook, the hole in the draw-head, through which it must pass, should be as large or larger than such square or flat-sided portion. By this arrangement the crank-pin can be made, by its angular portion, to have such a connection with the hook as is necessary to lift the hook, and this without other means of attachment, and yet can be readily removed when, by reason of being worn out or broken, it becomes necessary to substitute another for it. Furthermore, the flat-sided portion of the pin forms a shoulder which bears against the inner face of the draw-head, and the larger circular bearing forms a like shoulder that bears against the hook, thus keeping the parts in proper relation and preventing binding and chucking when sightly worn.

The recess A', (Fig. 4) within the draw-head for the reception of the link is only of sufficient length to allow of proper clearances between the end of the link and hook. To insure correct action, shoulders a^2, are provided, against which the end of the link strikes, thus preventing it being shoved too far into the draw-head when the pro-

jected end of the link comes in contact with the pivoted hook contained in a corresponding draw-head. The provision made by the shoulders a^2, compels the link to press against the outer inclined face of the hook of an approaching draw-head, thereby raising it up and allowing the end of the link to pass underneath and behind it, when the hook, by the aid of its weighted head, falls promptly into the central space of the link, thus securely fastening the contiguous draw-heads together.

In Fig. 5 is shown a mechanism by which the uncoupling is effected from the top of the car, and is rendered entirely independent of the jolting of the cars while in motion. The upper part of the rod H′, is provided with notches h, which engage with a plate, H^2, for the purpose of holding the hook-bar up when it is desired to "shunt" cars.

The inventor has assigned his patent rights to Isaac B. McQuesten, of Hamilton, Ont., and Calvin B. McQuesten, of New York City.

Schuhmann's Valve for Engines.

GEORGE SCHUHMANN, of Reading, Pa., has recently invented an improvement in the construction of valves for engines, consisting of a balanced slide-valve constructed and combined with the cylinder and an exhaust-chest of a steam-engine, and also the combination of this balanced valve with a cut-off valve. The construction and operation of the device are shown in the accompanying cuts.

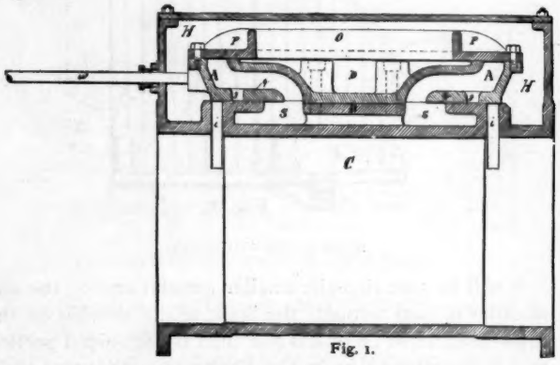


Fig. 1.

SCHUHMANN'S VALVE FOR ENGINES.

Fig. 1 is a sectional view of a cylinder, showing the improved balanced valve and exhaust-chest; Fig. 2, a transverse section through the cylinder and valve, and Figs. 3 and 4 are modifications hereafter explained.

The steam cylinder C, has the usual ports i i, but where the exhaust port is generally located there is in this case a steam chamber S, which is in communication with the steam inlet J. The valve proper may be called a sliding steam-chest and consist of a frame A, with two internally projecting plates q q, in which are located the ports g g. The cover P, is bolted to the frame A, and forms part of the valve-box.

A stationary distance-piece D, is bolted to the bridge B, and forms the seat for the cover P; the valve-stem w, is connected to the valve-gear in the usual way. The interior of the valve is always in communication with the steam-chamber S, and the pressure acting on the plates q q, will force the valve to its seat on the cylinder, while the pressure acting on the exposed surfaces of the cover P, tends to lift the valve off its seat; consequently if the area of the exposed surfaces of the cover is equal to the area of the plates q q, (minus the area of ports g g, and overhang), the pressure in both directions will be equal and the valve balanced; but as in certain positions of the valve, steam in one or other of the ports i i, assists in forcing the valve off its seat, and as it is necessary to have a preponderance of pressure towards the seats so as to counteract the lifting tendencies of the particles of steam

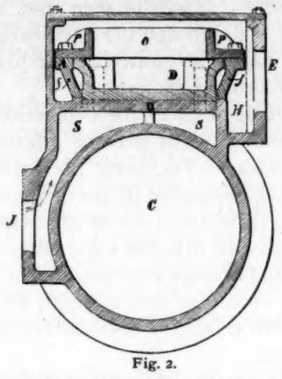


Fig. 2.

SCHUHMANN'S VALVE FOR ENGINES.

that find their way between the rubbing surfaces, the area of the plates q q, is somewhat enlarged. The sides f f, of valve-box A, project inward for the same purpose. The exact proportion has been determined by experiments. When the valve is in its central position as shown in Fig. 1, the plates q q, overhang the valve-seat to the extent of about half the travel of the valve, so that the difference between these two areas, of the plates q q, and the cover P, that are exposed to the pressure of the steam, shall remain constant at each end of the valve in every position. The steam after having performed its duty in the cylinder, passes through the exhaust-chest H, and the exhaust-pipe E.

In order to keep the valve tight on both seats, that is, on the cover as well as on the cylinder, it is important that the distance-piece should always be the same height

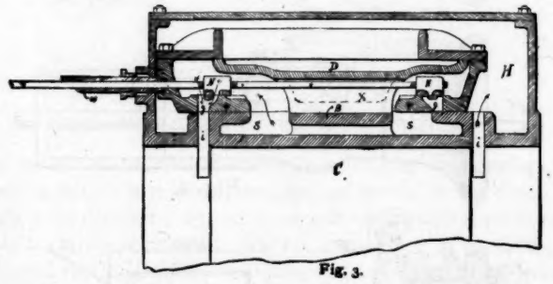


Fig. 3.

SCHUHMANN'S VALVE FOR ENGINES.

as the valve-frame, no matter what the temperature of the steam is. As the valve-frame is surrounded by exhaust-steam and has live-steam inside, the metal will take the mean temperature; by depressing the distance-piece and making a large opening O, in the cover P, so as to allow the exhaust free circulation, the distance-piece will be similarly effected, and by giving it the same thickness of metal as the valve-frame they will always expand and contract alike.

Fig. 3 shows the valve in combination with a Meyers' cut-off, so extensively used on marine engines. The cut-off

valves N N, have their seat on the back of the plates *q q*, the distance-piece has a slot X, cast in, and the main valve-stem is made tubular, so as to allow the passage of the cut-off valve-stem *v*. Extending the valve-frame by adding exhaust-passage *m m*, (Fig. 4) and casting an exhaust port *y*, near each end of the cylinder, the exhaust-chest H, can be dispensed with, or a hot-air jacket may be substituted, and the refrigerating action of the exhaust-steam on the outside of the valve will thus be done away with.

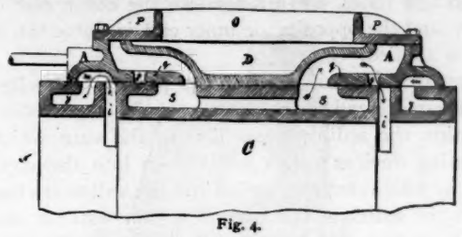


Fig. 4.

SCHUHMANN'S VALVE FOR ENGINES.

After the valve-seat on the cylinder has been planed, the distance-piece and the valve frame are bolted to the seat while the cylinder remains on the planer; then a finishing cut is taken off the top of the valve-frame and distance-piece so as to insure perfect parallelism between the two valve-faces which are afterwards scraped and finished, while steam of the working pressure is in the valve. The face of the bridge B, is a little below the valve-face of the cylinder so as to facilitate the scraping.

By removing the lid of the exhaust-chest, the valve described above affords the freest inspection all around while under working pressure—in fact, the engine can be run with the lid removed. It can, therefore, be fitted until all leakage disappears, and if once tight, it will remain so no matter whether it wears straight, concave or convex, because the wear on both faces is in the same direction, and one cannot wear without the others wearing just as much.

The inventor claims that his device possesses extreme simplicity, having but three parts; that it is durable as the pressure is relieved, and that it is inexpensive, easy of inspection and not liable to derangement.

Barrett's Lifting-Jack.

JOSIAH BARRETT, of Allegheny, Pa., is the inventor of a new lifting-jack, which is herewith illustrated and described. The invention consists chiefly in an application of two alternately-acting pawls, one of them acting at the up stroke and the othe at the down stroke of a lever or handle, for raising or lowering the lifting-bar of the jack. Fig. 1 is a side view of the jack, showing its working mechanism, and Fig. 2 a front view.

A represents a square box, in cross-section, open at its top and bottom, and of about one-half the height of the jack when raised to its utmost. The box rests on a foot *a*, and is supported by braces *b*. At the back of the box is an opening *c*, extending to nearly two-thirds of its height from the foot upward, and in front is an opening *d*, nearly the width of the box, that begins where the former ends, and extends upward to the top, where the box is surrounded by a band *e*. Within the box A, stands a ratchet lifting-bar B, that fills its interior, of which bar the ratchet side is turned forward. From the rear of the lower end of the lifting-bar projects a lifting-piece C, which is raised and lowered with the bar and moves up or down in the opening *c*. To the sides of the box A, where the front opening *d*, begins, are firmly attached two brackets D D′, opposite to one another. These brackets project forward beyond the box, and in them is pivoted a lever or handle E, that has attached to each side of its pivoted end, a disk *f* and *f′*, which disks turn back and forth when the handle is raised or lowered. The disks and the pivoted end of the handle fill the space between the brackets in front of the box. From the inside of the disk *f*, horizontally extends a small shaft or spindle *l*, through the disk *f′*, projecting beyond the bracket D′, at the end of which spindle is a weighted lever *g*; and from the inside of the disk *f′*, extends a similar spindle *l′*, through the disk *f*, and bracket D, with a weighted lever *g′*, at its end. The spindles *l l′*, are at a distance from each other equal to the distances between two notches on the ratchet, and so placed that when the handle E, is held level and a vertical line drawn upward from the center of its pivot, one of the spindles is found at one side of it and

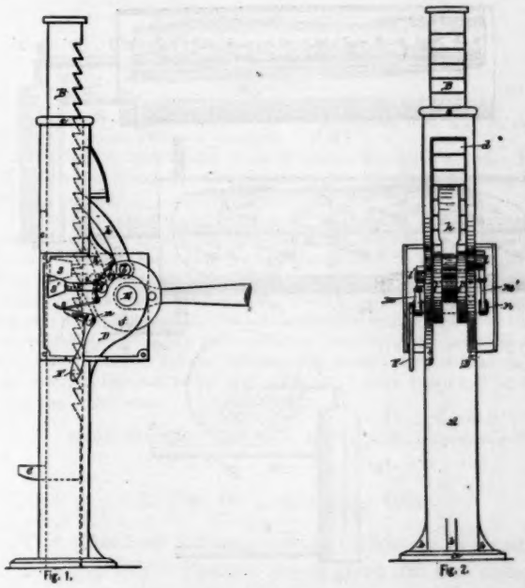


Fig. 1. Fig. 2.

BARRETT'S LIFTING-JACK.

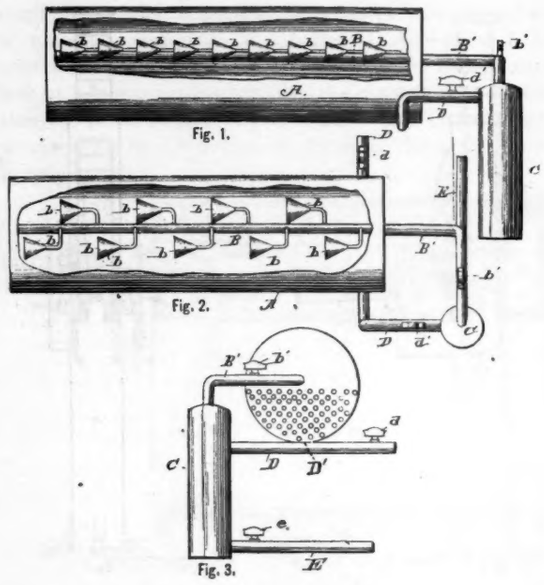
the other on the other side, so that by moving the handle up or down one of the spindles will be lowered as much as the other is raised. On the spindles *l* and *l′*, between the disks *f* and *f′*, are secured two pawls *h h′*, one on each, of which *h*, the longer of them, reaches over the other. The free ends of the pawls lean against the ratchet on the lifting-bar B, and by the alternate motion of the handle one of them is made to lift the bar, while the other enters the notch next presented by the rising bar, and in its turn lifts when the motion of the handle is reversed. To cause the lifting-bar to descend by the same motion of the handle, after having been raised, the lever F, at the side of the box is pushed up, by which a spindle *n*, that projects from both sides, is partly turned. On the projecting ends of the spindle *n*, are cranks *m*, that, when turned up alternately, raise the springs *s s*, attached to the weighted levers, removing thereby the weight or downward pressure that holds the pawls

against the ratchet, and slightly raising the pawls successively. If the handle E, be raised, the lower pawl drops, while the upper holds the lifting-bar; and when the handle is pressed down, the lower pawl upholds the same, while the upper one drops to the notch next above. In this manner the lifting-bar is raised and again lowered by the same motion of the handle, requiring only a change of position of a lever to reverse its direction by being brought in contact with the springs.

The sale of the lifting-jack is controlled by Messrs. Fairbanks & Co., of New York City.

Craig's Boiler-Cleaner.

LLOYD A. CRAIG, of Woodson, Ill., is the inventor of an improved boiler-cleaner for locomotive and stationary boilers, which is herewith illustrated and described. It is the object of the inventor to provide a simple attachment for steam-boilers whereby the sediment may be gathered in the boiler and delivered in a sediment-chamber while the boiler is generating steam.



CRAIG'S BOILER-CLEANER.

In the accompanying cuts, Fig. 1 is a side view, Fig 2 a top plan view, and Fig. 3 an end elevation, of a boiler provided with the attachment. In Figs. 1 and 2 the boiler is broken away.

The boiler A, may be of any desired form or construction, and has extended longitudinally through it the conveying-tube B, which extends at B', beyond the front or outer end of the boiler and opens into the sediment-chamber C, at or near the upper end of such chamber, as shown. This tube B, has secured on it within the boiler, gathering-bells or funnels *b*, opening at their mouths toward the inner ends of the boiler, and connected at their opposite ends with and opening into the confluent or conveying tube. The number of these funnels may be varied at will, but it is preferable to use a number of them, and to arrange them at close intervals, as shown. A return-tube D, opens at one end into the sediment-chamber, near the upper end of the latter, and has its other end carried to and opened into the boiler at about D'. The sediment-chamber is provided at its lower end with a discharge-tube E. This tube E, has a valve *e*, so that the discharge may be opened or closed at will. A valve *b'*, is arranged in the tube B', between the boiler and sediment-chamber. A valve *d*, is arranged in the extended end of the return-tube beyond the boiler, as shown, and a valve *d'*, is arranged in tube D, between the boiler and sediment-chamber. The sediment-chamber and the several connecting-tubes are arranged at the outer end of the boiler, and the opposite or inner end is where the fire or heat is applied.

The circulation of water in the boiler is naturally from the fire-place end to the outer end. This carries in such direction the sediment and lime in the water which the gathering devices collect and convey into the confluent tube, by which they are carried into the sediment-chamber, where the sediment is delivered and the water is returned to the boiler. This circulation is kept up by the heat. By closing the valves *b'* and *d'*, the sediment-chamber can be shut off and the water retained in the boiler. The boiler may be "blown" out in the usual manner, and by valves *b' d d'*, the pipes B' D, may be also blown out, and the operation may be extended to the chamber C, by opening the valve *e*, in the pipe E.

By the described construction it will be seen the boiler is kept free from deposits by the circulation constantly carrying the sediment, lime and other foreign substances into the sediment-chamber, whence they may be drawn when accumulated in any considerable quantities.

The return-pipe D, opens into the boiler at D', and is extended beyond the point of connection at D', and is provided between the sediment-chamber and the point of connection D', with a valve *d'*, and between the connection D', and its extremity, with a valve *d*. By the valves *b' d'*, the sediment-chamber may be cut off from the boiler, and, by opening the valve *d*, the boiler will have a discharge through the extremity of the pipe D, as is desirable in blowing off, etc.; or the valve *d* may be closed and the valves *b' d'* opened to permit the circulation desirable for cleaning the boiler of sediment while in use.

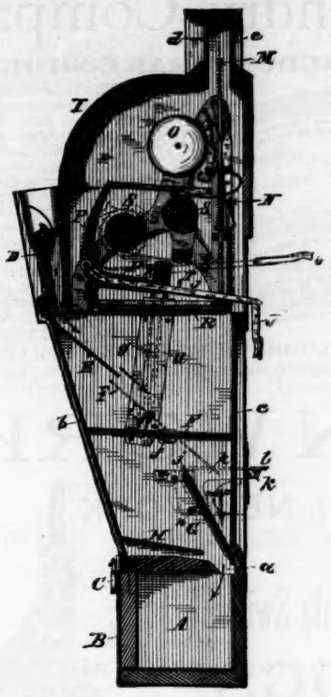
Maltby's Fare-Box Indicator.

CLINTON H. MALTBY, of Dayton, O., is the inventor of a fare-box indicator which is herewith illustrated and described. It is primarily intended for use upon street-cars, omnibuses, and similar public vehicles, but it may also be used in other places where fares are deposited. The invention consists in the combination, with a locked permanent receptacle and temporary retaining and inspecting receptacle, of indicating and recording mechanism operated by a series of keys or levers, under control of the driver or person in charge, whereby the fares and tickets temporarily arrested in the inspection-chamber by the successive operation of the keys and levers have their respective values indicated successively by means of projecting and disclosed tablets, which values, by the same operation that discloses them, are permanently recorded, the indicating and recording taking place while the fares remain in the inspection chamber, so that the occupants of the car, or the persons paying, can see that all are properly indicated and recorded, after which, by the operation

of another and independent lever, the fares are released and fall into the permanent locked chamber, or receptacle.

There is an opening in the side of the box, covered by a grating through which the light at night may be admitted from a lamp in the inspection-chamber. In the present instance there are four levers J, whose buttons are marked "3," "5," "Half T," and "Ticket" respectively, meaning three cents or half fare, five cents or whole fare, half ticket and whole ticket respectively.

By this means an accurate register of all the fares is



MALTBY'S FARE-BOX INDICATOR.

made in the presence of the passengers, whose attention is called thereto by the sound of a gong every time a lever is operated; and this record being inclosed and locked up, cannot be altered or tampered with, and must in every case correspond with the contents of the drawer A. The paper on which the record is made, is consecutively numbered on the back, so that the person unlocking the box cannot abstract any part of the paper, and it is intended that the paper should be sent to the treasurer of the company, and counted to see that it compares with the cash reported. It is a check against the person who unlocks the box and takes the money out.

The inventor has assigned the patent to the National Cash Register Co., of Dayton, O.

An Improved Train-Signal.

THE Pennsylvania Railroad Company have recently decided to equip all their passenger-trains on all divisions of the road with the Westinghouse train-signal, which does away with the bell-rope running from car to car, and gives the conductor and brakemen the means of signalling the engineer at a second's notice. With the present system used on all other roads, of a cord running from the engine-cab to the end of the train, there was always danger of accidents from the inability of the brakemen, especially those on the last cars of a long train, to signal the engineer with unfailing rapidity; as the rope had to be very long it was liable to get entangled.

The pneumatic system adopted by the Pennsylvania road, which has been in use on some of the companys' trains for nearly a year, is simple and effective. A tube containing air at a pressure of fifteen pounds runs from a whistle in the engineer's cab to the rear of the train. The whistle is so arranged that if the pressure in the tube is diminished it will sound and warn the engineer to whistle "down brakes" and reverse his engine. In each car of the train is a valve under control of the brakeman, which upon being opened, allows the compressed air to escape from the signal-tube. The action of the valves upon the whistle in the engine-cab is instantaneous. If an accident happens by which a car is detached from the train or the train breaks apart, the effect is, of course, the same as opening a signal-valve; the pressure is lowered and the signal sounds. The adjustment of this tube from car to car is done on the same principle as that by which the air-air-brake tubes are coupled, and takes far less time than it does to connect the bell-ropes. The same air-pump compresses the air for the brakes and the signal-tube.

Copper Sleeves for Valve-Stems.

[COMMUNICATED.]

KINGSTON, PA., May 12, 1885.

Editor American Railroad Journal:

In the issue of March, 1885, of the AMERICAN RAILROAD JOURNAL I saw an article and sketch of an improvement in valve-stems by using steel sleeves on them.

I have been using copper sleeves on valve-stems of locomotives for over eight years. I put others on when the valve-stems are so worn as to require renewing and I take the valve-stem when in this condition and turn it parallel and to a size suitable to shrink the copper sleeve on, the sleeve being tinned for about one inch on each end and also the corresponding part of the valve-stem. The copper sleeve is then shrunk on and afterwards sweated on. When the valve-stem is not long, the sleeve is made long enough to butt against the valve-rod socket. I think that the copper sleeve is superior to the steel sleeve, as I have found it so with the solid steel valve-stem.

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A Test for Lubricating Oils.

THE *Chemical Review* gives the following as a test for lubricating oils: Place a single drop of the different kinds to be compared, in line across the end of a piece of plate-glass about twenty-four inches long, one end being placed six or eight inches higher than the other, to form an inclined plane. The drops of oil run down this smooth plane in a race with each other. The quality of the oil for lubricating purposes is shown by the distance traveled, and the trace left by the drops. Thus, on the first day, sperm oil will be found in the rear, but it will in time overtake the rest, and retain its power of motion after other oils have dried up. A light-bodied oil flows quickly, like water, but also dries, whereas what is needed is a good body compared with a limpid flow. Many oils have a good body, but have a tendency to gum, and will be distinctly shown upon the glass.